



49115

FEBRUARY 1977

\$1.50



# radio control MODELER

THE WORLD'S LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST





# RCM MODELER

## FEATURES

FROM THE SHOP .....	2
CUNNINGHAM ON RC .....	6
ENGINE CLINIC .....	10
RECYCLE YOUR OLD PLANE .....	15
RADIO SPECTRUM .....	16
RACING AT RANDOM .....	20
FOR OLD TIME'S SAKE .....	22
SOARING .....	30
BAA, BAA, BLACK SHEEP .....	33
BATTERY MANAGEMENT SYSTEM .....	36
QUICKIE 100 .....	41
SAMURAI .....	48
HERE'S HOW .....	54
TACH-TRON HELICOPTER CONTROL SYSTEM .....	57
RCM PRODUCT TEST — TWEEDY BIRD .....	62
RCM PRODUCT TEST — LEGIONAIR 100 .....	63
EARLYBIRD BIPE .....	64
HOME-MADE HI-START .....	70
SUNDAY FLIER .....	73
RCM PRODUCT TEST — DELTHON .....	76
RCM PRODUCT TEST — MISS AMERICA .....	77
POWER BOATING .....	78
MINIATURE TOW WINCH FOR SAILPLANES .....	80
WANT TO TAKE THE GUESSWORK OUT OF YOUR MODEL ALIGNMENT? .....	85
FOR WHAT IT'S WORTH .....	86
ENGINE SIZE, WING LOADING, AND RELATED PROBLEMS .....	90
DICK'S DISCOVERIES .....	92
TORQUE RODS — STAGE 2 .....	94
SHOWCASE '77 .....	98
RCM PRODUCT TEST — QUICKIE 200 .....	100
WHITHER THERMAL SOARING? .....	101
RCM PUZZLE & WINNERS .....	184-185
MODEL OF THE MONTH WINNERS .....	189
READERS EXCHANGE .....	191
ADVERTISER INDEX .....	192
READER SERVICE .....	192

# FEBRUARY

**Editor and Publisher**  
Don Dewey

**Executive Editor**  
Patricia Crews

**Technical Art Editor**  
Dick Kidd

**Graphics Editor**  
Barbara Richardson

**Assist. Graphics Editor**  
Mary Robillard

**Art Editor**  
Susan Steele

**Photo Editor**  
Dick Tichenor

### Associate Editors

Randy Carmen — Ken Willard — Don Dombrowski — Jerry Smith  
David Thomas — Doug Spreng — Clarence Lee — Fred Reese  
Al Kindrick — Chuck Cunningham — Jim Oddino

### Contributing Editors

Bill O'Brien — Joe Bridi — Bernie Murphy — Tony Estep  
Grady Howard — Dick Sonheim — Ben Strasser  
Gil Horstman — Jim Simpson

### Office Staff

Beverly Calhoun — Jane Wall — Pat Johnson — Lynne Gillett  
Chris Nicholson — Barbara Norton — Sheila Pierce  
Bridget McCloskey

### Plans Dept.

Danny Nicholson — Mike Franceschini



### THIS MONTH'S COVER

Robert Conrad in his starring role as World War II U.S.M.C. air ace, Major Gregory 'Pappy' Boyington in the hit television series, "Baa Baa, Black Sheep" See RCM's feature story on page 33. Ektachrome transparency courtesy of the National Broadcasting Company.

**R/C MODELER MAGAZINE** is published monthly by R/C Modeler Corporation, Don Dewey, President. Editorial and Advertising offices at 120 West Sierra Madre Boulevard, Sierra Madre, California 91024. Telephone: (213) 355-1476. Entered as second class matter at Sierra Madre, California, and additional offices. Contents copyright 1977 by R/C Modeler Corporation. All rights reserved. Reproductions in whole or part, without written permission of the publisher, is prohibited.

**EDITORIAL CONTRIBUTIONS** are welcomed by R/C Modeler Magazine, but cannot be considered unless guaranteed exclusive. Manuscript must be accompanied by return postage and any material accepted for publication is subject to such editorial revision as is necessary, in our discretion, to meet the requirements of this magazine. Editorial material is selected on the basis of general interest to the radio control enthusiast and the publisher assumes no responsibility for accuracy of content. The opinions stated in published material are those of the individual author and do not necessarily reflect those of the publisher. R/C Modeler Corporation assumes no responsibility for loss or damage of editorial contributions. Upon acceptance, payment will be made within 30 days of publication, at our existing current rate, which covers all authors rights, title to, and interest in, the material mailed including, but not limited to, photos, drawings, and art work, which shall be considered as text. Submission of the manuscript to R/C Modeler Magazine expresses a warranty, by the author, that the material is in no way an infringement upon the rights of others.

**SUBSCRIPTION RATES:** The United States \$16.50 per year, \$32.00 two years. Single copies \$1.50 each. Add \$2.50 per year for postage outside of the U.S. (except APO's and FPO's). Change of address notices, undelivered copies and orders for subscriptions are to be sent to P.O. Box 487, Sierra Madre, California 91024. Allow 6 weeks for new subscriptions and changes of address.

**ADVERTISING:** Send advertising copy and complete instructions to Advertising Department, R/C Modeler Magazine, P.O. Box 487, Sierra Madre, California 91024. Telephone: (213) 355-1476.



DON DEWEY



● The following news item, reprinted from the September 1976 issue of "Chemistry In Canada", may be of interest to you.

## Spraying with Model Airplanes

*A promising new method of crop protection in a small-scale operation has been tested in New Brunswick. A radio controlled model aircraft was used successfully to spray a 2.4-ha Christmas tree farm infested with spruce budworm.*

Model aircraft are small and portable and, in a few minutes, can deliver potent dosages of concentrated insecticide at low altitudes with relatively little risk to the operator. The major disadvantages are their fragility and the special skills required to operate them. However, radio controlled model aircraft clubs are becoming increasingly popular, and could supply the future spray operators if a dependable spray plane were developed. For this trial a Senior Telemaster model aircraft manufactured by Alexander Engle Co., West Germany, with a 240-cm wing span, a 1.2-hp engine (at 12,000 rpm), and a capability of lifting a 4.5-kg load was fitted with a nozzle from an "ULVA" hand-sprayer. The sprayer was powered by a 7-watt electric motor that drove two stacked corrugated plastic atomizer discs with serrated edges at a speed of 7,000 rpm; the motor ran continuously when the aircraft was in flight. Fenitrothion E.C. (74% a.i.) in 50% emulsion with water was emitted through a valve that could be opened or closed from the ground by a radio-controlled servo. The spray tank was a collapsible 2.3-liter plastic bag fitted inside the fuselage. Part of the engine exhaust was piped into the bag to supplement normal air pressure in forcing out all the insecticide. The rate of flow was regulated at 63 ml/min, while the aircraft engine was running, by a hose clamp above the spray nozzle. The final indication of success came at the end of the growing period. The sprayed blocks were virtually free of budworm damage, while in the surrounding areas damage was severe, reported the Maritimes Forest Research Centre, Fredericton, N.B.

Our thanks to P. Blais of Ottawa, Ontario, Canada, for forwarding this news release to us.

\* \* \*

The following notice of a proposed Lindbergh Memorial Award was received from Frank Zaic and we are reprinting it for your consideration and possible participation:

While I was visiting my family in New York, my brother John wondered why we did not have a Memorial Award honoring Charles Lindbergh. When we think of it, only those of us who were model builders before his 1927 flight to Paris, realize the tremendous impact his achievement had on the future of model aeronautics. While we counted ourselves in thousands before 1927, now we are millions. A Lindbergh Award now seems so timely that one wonders why it was not proposed before.

On my way back to California, I stopped at the Nationals. I spoke about the Lindbergh Award to everyone I met. The response was enthusiastic. Everyone was for it. The ever-practical Frank Ehling said that we would have no trouble finding a sponsor—our trouble might be finding or selecting a recipient. But this can be solved when the time comes.

At the moment, our objective should be to determine whether or not we want a Lindbergh Award—(should there be a doubt?), method of financing, finding an artist/sculptor who would do justice to our subject. (We want something comparable to Collier and similar awards now in existence.) The trophy should be ready for presentation by May 27, 1977, the 50th Anniversary of Lindbergh's Non-stop Flight from New York to Paris in 36 Hours.

It is my personal belief that the sponsors of the Award should be the Model Airplane Enthusiasts of America. The Award to be presented to the person(s) who made a major contribution to Model Aviation. The presentation to be made in Washington, D.C., by a dignitary, so that the event will receive national attention every year on May 27th.

The trust fund should be generous (\$10,000?) to have a trophy worthy of the one we honor, and at the same time

provide annual sum for traveling expenses of the recipient(s) to Washington, D.C., and to pay for the replica which he will keep. In many ways, this Award is a challenge to the maturity of our hobby.

Time is short if we want to have the Award ready for presentation by May 27, 1977. Your help and cooperation will be needed. It is an effort that encompasses the entire spectrum of model activities. AMA President, John Clemens, I am sure, will appoint a committee to coordinate our mutual effort.

The Executive Council has tentatively approved the Lindbergh Award. Only funds are needed to make it a reality. We should give the model builders the first chance to become sponsors. How?—it has been suggested that we use the existing chain of communication: District Vice-Presidents, Associate Vice-Presidents, Contest Coordinators, Club Presidents, Club Newsletter Editors and others. By doing so the work load of spreading the news, and gathering the contributions will be minimal on everyone concerned.

Whatever your position, your help and cooperation to make the Lindbergh Award a reality, is needed very much.

\* \* \*

We got quite a kick out of the following story which was printed in the Shawnee Mission Radio Control Club newsletter "Feedback".

It seems there was this guy who had such a high I.Q. that it caused problems for him. He couldn't get a date cause he couldn't carry on a simple conversation, etc. He was smart so he invented a machine that would reduce his I.Q. and make him more normal. His assistant was to plug it in and leave him for about one hour. This would lower the guy's I.Q. to about normal. So the genius put the machine on his head and the assistant plugged it in. He was to come back and unhook the guy in about an hour.

Well, the doorbell rang. Avon Lady. The assistant got carried away and bought two bottles of Eau d'Nitro perfume and a Toofie Toothbrush. This took about three hours cause you know how

to page 188





12111 Beatrice St.  
Culver City, CA 90230



90" MUSEUM SCALE LIBERATOR



55" SPORT SCALE AIRACOBRA



P-51 MUSTANG



44" SCALE SPERRY MESSENGER



48" PATTERN SCALE EAA ACRO SPORT



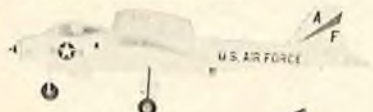
72" SCALE COMANCHE



63" SCALE AIRCOUPE



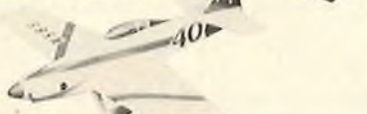
59" PATTERN SCALE CHIPMUNK



63" TRAINER WEEKENDER



FORMULA 1 RICKEY RAT



FORMULA 1 SUPER MINNOW



TOM KITTY MK 15 & MK 40

## Cunningham On RC

### CHUCK CUNNINGHAM



● I wonder how many biplane kits have been sold since the movie "The Great Waldo Pepper" came out on the tube in November? A fantastic flying movie! If you missed it in the theaters and also missed it on TV, make sure that you see it when the Spring re-run time begins. The flying shots are superb. It makes me want to go out flying just thinking of it!

◇ ◇

I have heard from a number of modelers who have constructed the "Big Lifter" from the three views that I presented several months ago, and have also received numerous letters asking for complete plans and a construction article on the "Big Lifter". Evidently, there is really quite a bit of interest in a model that is designed to be a real work horse, so if I can ever get finished with a couple of current projects, I will make up a set of plans for the "Big Lifter". The ones that I have heard of have been lifting weights of several pounds with ease and have been quick on the take-off, although loaded with payload and have been easy to fly in tight places, so this will be a worthy project in the near future.

◇ ◇

My current interest is in building and flying Old Timers and Antique aircraft, and one of the real problems is that you can't go back and design one yourself --- you have to stick with a published design. Here in the Texas area, we have been taking a bit of a different look at this type of aircraft, as well as this type of flying. We don't look on it as radio assist, rather we are looking on this type of aircraft as a radio controlled aircraft of unlimited potential. As my good friend, and thirty year flying buddy, Helmer Johnson says, "It really combines the best of both worlds --- powered flight and great soaring ability". And these aircraft do exactly that. I am currently constructing a Dallaire Sportster from John Pond plans, and building this aircraft reminds me that a few words of advice would be helpful to those of you just getting into this facet of the hobby/sport.

First, let's take a look at constructing this type of airplane, and then later on we will look at test flying and trimming which is an art all in itself.

If you are building an Old Timer from plans taken from the original kit, or from a magazine plan, then you are going to

have to count on some extensive modifications and structural beefing-up before you will have an aircraft that will be suitable for good radio controlled flying. My Powerhouse, for example, is just like the original model, except for lots of extra muscle in the structure of the aircraft --- muscle that is needed because I am running a Schmeidler .40 in it which has one heck of a lot more power than the old Forster .99 engine. My Powerhouse is quite at home doing consecutive loops, consecutive rolls, inverted flight, high speed low passes, touch-and-go's, fast climb-outs, and just about anything else that a radio controlled model should be able to do. But once this jacking around is done, it will grab lots of sky behind the .40 and soar like a bird. But, when I was building it, I designed this capability into the structure of the aircraft, and you should do this also if you plan to fully enjoy your old timer.

To begin with, almost all of this type of aircraft has a fuselage that is of stick and stringer construction. This makes a light, quickly built structure, but not a very strong one. The first thing to do in beefing up is to install balsa sheet reinforcement all around the nose. This can be 1/4" sheet inlaid between the sticks at least back as far as the center of the wing. At the same time, add balsa gussets at the place where the wing hold-down dowels will pass through the fuselage. Reinforce this area in the direction of pull of the rubber bands. Also reinforce the cabin area below the wing saddle by adding extra upright pieces. If you don't, you will find that the pull of the rubber bands holding the wing in place will begin to compress the cabin structure, thus changing the angular difference between the wing and the horizontal stab and, as a consequence, changing the pattern of flight. It's a pretty good idea to use a bulkhead just at the front of the cabin to give a measure of added rigidity to the fuselage structure.

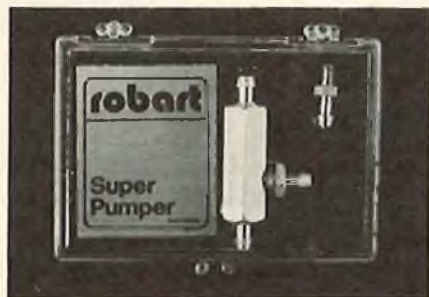
One of the most important things that you can do to increase the strength of the fuselage is to reinforce each joint between the fuselage uprights, the cross braces and the longerons, with triangular gussets made of 3/16" hard balsa sheet. These should be triangular pieces about 1" on each leg. Glue these

to page 181



# Engine Clinic

CLARENCE LEE



● This month, I would like to give you a report on my findings on the Robart Super Pumper. Hardly a month goes by in which a new product of some sort is not introduced on the hobby market. Many are just a modification of some previously marketed item. Sometimes the new product will have something to offer and other times it is just another manufacturer trying to get his piece of the model market. The Robart Super Pumper has probably caused more interest in the last few months than any other product. I have received many letters and phone calls from R/C fliers wanting to know if it works, how well it works, etc. By the time you read this report, the Super Pumper will have been available to the modeling public for about 4 months, so many of you will have found out for yourselves. We did try to obtain one of the Super Pumpers prior to its general release, but were unsuccessful. We received ours about a month ago when they were first released to the hobby shops. We always try to get new items that have something different to offer to your attention as soon as possible but, with the time period involved to do the testing and the magazine lead time, a new item can be available for several months before we can give you a report on it. Then, too, sometimes we like to see how the item works in the field in the hands of more than just one or two people.

The Robart Super Pumper works — and it works very well. Naturally many people will be comparing it with the Perry Pump and wondering if it has any advantages, disadvantages, or exactly how do they compare. So let's do a little comparing and see exactly how the differences stack up.

The Perry Pump, as most of you already know, replaces the backplate on

an engine and becomes part of the actual engine. In some cases, due to the extra length of the pump, it is necessary to move the engine forward. This cannot be done with all installations, so modifications to the nose have to be made. Actually, this is not that big of a deal, but some modelers have not been able to use a Perry Pump engine because it would not fit their existing model. The Robart Super Pumper is an individual unit mounted separately from the engine so no modification to the aircraft is required.

Both pumps utilize crankcase pressure to create the pumping action. The Perry Pump has a large diaphragm that is actuated directly by crankcase pressure — the diaphragm being inside of the engine when the pump is installed. On the upstroke of the piston, negative pressure moves the diaphragm inward and on the down stroke of the piston, positive pressure moves it outward. With the use of two one way valves, a pumping action is achieved. Because the Robart pump mounts independently, the back plate of the engine has to be drilled and tapped for a pressure fitting. A line is then connected to the pump and, again, variations in crankcase pressure actuate a small diaphragm in the pump body. And, as with the Perry Pump, the use of two way valves creates a pumping action. Robart recommends drilling a hole in the center of the back plate on a front rotor engine and tapping for the pressure fitting. On a rear rotor, you drill and tap the hole at the lower end of the port. Quite frankly, the instructions are a bit vague here and I am not really sure of their intentions. Tapping into the back plate of a rear rotor engine can give you timed pressure — considerably greater than untimed or differential pressure as intended to be used with this pump. There is no big problem here, however, as most rear rotor engines utilize a pressure tap that threads into the bypass of the engine which, in turn, is used to pressurize the fuel tank on racing engines. This same pressure tap can be used to actuate the Robart Pump. I was also puzzled as to why Robart recommends drilling a hole in the middle of the back plate for installation of the pressure tap on a front rotor engine. As in the case of a rear rotor engine, the back cover

screw hole that leads in to the engine bypass, can be used and all that is required is to remove the screw and screw in the tap. First, of course, check to be sure that the screw hole is drilled all the way through into the bypass or crankcase chamber. The Robart pressure fitting supplied is a bit short to do this, but Fox makes both a 6-32 and 4-40 pressure tap for this purpose and K & B makes a 4-40. The holes through these fittings should be enlarged to 1/16" when used with the Robart Pump. Most all engines use either a 4-40 or 6-32 screw size with the exception of some of the foreign imports which use a millimeter size. In this case, you would have to use the fitting supplied and drill and tap as per the instructions included with the Robart Pump. We did all of our testing using a K & B .61 and K & B front rotor .40 using the pressure tap in the back cover screw hole with no problems.

The Robart Pump, unlike the Perry Pump, is strictly a pump. It has a fine adjustment for increasing or decreasing pressure, but has no regulator. Hence it is more susceptible to variations in fuel head than the Perry Pump which does have a regulator. If you were to connect a foot long piece of fuel line to an engine using a Perry Pump — start the engine and set the mixture — then raise or lower the tank, there would be no change in needle setting at either high speed or idle. If you were to perform this same test with the Robart Super Pumper, the engine will richen as you raise the tank and lean as you lower it. Although the engine would still remain running at high speed, we could flood it out or cause it to die lean at idle unless the pressure adjustment was changed. In an aircraft under actual flying conditions, this presented no problem, however, our fuel tank was mounted directly behind the engine in the normal manner rather than a foot away. We did notice more of a variation in needle setting between a full and near empty tank with the Robart Pump than with the Perry, again, due to the lack of a regulator. We experienced no problems with the Robart Pump, although it was a bit touchy getting the idle and mid-range set-up. There was a tendency to load up through the mid-range. We tried lowering the pressure, but this resulted in the

to page 12



# PATRICIA

DESIGNED BY T. OKUMURA

ENGINE SIZE — .61  
WING SPAN — 64.75"  
AREA — 679.8 sq.in.

**KIT PRICE: \$109.95**

California residents add 6% sales tax

Also available: T2A—\$129.95  
(All Fiberglass Pattern Plane)

employs all the up-to-the-minute  
"state-of-the-art" features:  
generous front end facilitates  
retractable installation  
as well as the new "pumper" engines

epoxy-fiberglass fuselage with molded-in  
vertical fin & molded-in canopy  
precision-cut foam wing & stab  
(1/64 ply wing/stab covering supplied)  
aerodynamically balanced rudder  
build it fixed-gear or retractable  
all balsa parts machine cut  
all hardware supplied  
detailed full-size plans  
(step by step instructions)  
super-fast assembly

## MASTERS CLASS FAI WINNER!

here is the most popular r/c competition  
aircraft in the orient and the first  
all new pattern plane in the past  
two years—now available!

dealer/distributor inquiries invited

## BOB SMITH R/C AIRCRAFT

BOB SMITH R/C AIRCRAFT • P.O. BOX 543 • CHATSWORTH, CA 91311 • (213) 996-9447

## ENGINE CLINIC

from page 10

engine mis-firing at high speed in long screaming dives, split esses, etc. The pressure was increased to eliminate the mis-firing and the carburetor idle mixture set slightly on the lean side. This was slightly leaner than we would have liked, but this helped the mid-range. Both a standard Perry Carburetor and large bore Perry Pump Carburetor were tried. The pump carburetor worked better through the mid-range, which is understandable as it had been regulated to be used with the Perry Pump. A non-pump carburetor, if used with the Perry Pump, will run excessively rich through the mid-range also.

So what, if any, are the advantages or disadvantages of the Robart Super Pump in comparison to the Perry Pump? Because of its ability to regulate fuel flow and sense the engines needs, I would have to rate the Perry Pump as the better unit, it being a more sophisticated unit to begin with. However, with the Perry Pump you are limited to its use on the .60 and .40 displacement size engines, and then to the front rotor designs only. The Perry Pump cannot be used on a rear rotor design engine — as most racing engines are. Herein lies the big market for the Robart Super Pumper. It can be used on any engine from an .049 through the .60's. The smaller displacement engines are notorious for weak fuel draw and very critical to tank position. With the Robart Pump, much of this problem can be eliminated, allowing the tank to be mounted farther from the engine and a larger fuel supply to be used. Modelers are always trying to use 6 or 8 ounce tanks with .19 size engines and then complaining because the engine loads up with a full tank and leans out and dies as the tank empties. Even though you will still have a slight variation in needle setting as the fuel level drops, due to the fact that the fuel is being supplied under pressure rather than depending on the engines own weak fuel draw, a considerable improvement in performance will be achieved. The introduction of muffler pressure has helped this problem somewhat, but not near as much as the Robart Pump can do.

I am sure that modelers will find many applications for the Robart Pump that I haven't even thought of at this time. Two engines can be run off of a common fuel tank in a multi engine installation using a pump on each engine — the fuel tank, in turn, being carried in the fuselage, etc. I have received many letters from modelers wanting to do this in the past when building a Scale Lear Jet, etc.

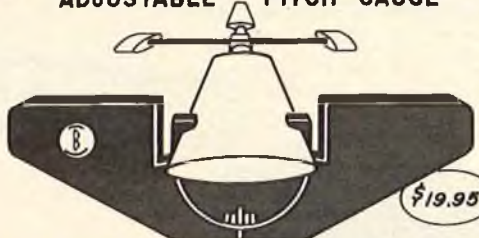
One word of caution I would like to point out regarding fuel used in the Robart Pump: Use only glow fuel con-

to page 14



## BACA PRODUCTS

### ADJUSTABLE PITCH GAUGE



\$19.95

For uniform accuracy. No guess work. Adjustable Pitch Gauge also includes Basic Gauge to set all symmetrical and flat rotor blades

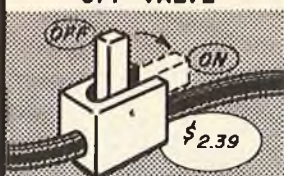
### BASIC PITCH GAUGE FOR FLAT BLADES ONLY



\$12.95

- Minimizes vibration
- Set to degree accuracy
- Carry in flight box
- Machined aluminum anodized

### FUEL LINE SHUT OFF VALVE



\$2.39

- Positive on
- Not affected by heat or fuel
- Red aluminum weighs less than 1/4 oz.
- Used on helicopter airplane, boat and cars with standard fuel line

### HELI-BABY



\$5.50 pair

### LANDING GEAR BRACES

- Reinforce landing gear
- Lightweight channel
- Machined aluminum close fitting
- Reduces shock damage

### PLUGGETS FOR ROM-AIR RETRACT



2 for .79¢

- Indorsed by Rom-Air
- Machined of Teflon
- Stops foreign material from entering system
- Prolongs life of O-rings saving costly maintenance

### ALL PRODUCTS AVAILABLE NOW!

Inquire at your local dealer. If unavailable order direct. Include \$1.00 for handling, Illinois residence 6% sales tax.

BACA PRODUCTS  
19 HAWTHORNE LANE  
STREAMWOOD, IL. 60103





## MICRO AERONAUTICS

An old favorite, the *Great Lakes*, assumes a new identity. With all structural components formed from aircraft grade aluminum, it is possible to obtain a new level of airframe strength and efficiency.

Aircraft aluminum has a tensile strength of 65,000 P.S.I. and a yield strength of 45,000 as compared to 4000 P.S.I. for balsa. This added strength, along with modern methods of assembly and more technical design of structural members, means an aircraft with much better strength to weight ratio.

**\$139.95**

We Accept BankAmericard & Mastercharge.

SEND CHECK, MONEY ORDER OR CREDIT CARD NUMBER FOR POSTPAID DELIVERY.

CALIFORNIA RESIDENTS ADD 6% SALES TAX.

C.O.D. ORDERS PLEASE ENCLOSE 20%

DISTRIBUTOR AND DEALER INQUIRIES INVITED.



## MICRO AERONAUTICS

**(714) 256-1626**

**332 S. SECOND STREET, BARSTOW, CALIFORNIA 92311**



- Wing Span 56".
- Wing Area 862.4 Sq. In.
- All Up Weight 6.25 - 7 lbs. (approx.).
- .40 to .61 Engine
- Major Components Such As Wing Panels and Fuselage Pre-Assembled on Factory Jigs.
- Assembly Time 6 to 8 Hours.

SPECIFICATIONS SUBJECT TO CHANGE AT MANUFACTURER'S DISCRETION.

### ENGINE CLINIC

from page 12/10

taining no gasoline or petroleum solvents. The diaphragm in the pump is evidently made of silicone rubber and just like the silicone fuel line, gasoline or petroleum solvents will cause it to swell and almost double in size. During our testing of the Robert Pump, we were also testing a new economy fuel that is supposed to give longer tank runs on the same amount of fuel, cost less, etc. Evidently, one of the fuel ingredients was gasoline, naphtha, or some petroleum distillate as our pump stopped working. Removal of the pressure inlet adjustment fitting showed the pump diaphragm bulging up out of the hole, having swollen considerably in size. This problem, however, was of our own making.

So, in summary, I would like to say that I feel that the Robert Super Pumper is a very useful item and well worth the \$15.95 selling price. Although on .40 and .60 size engines that can be fitted with the Perry pump/regulator, I would recommend the Perry Pump as the better way to go, due to the regulation ability, the Robert Super Pumper will now give the advantages of a pump to the other makes and sizes of engines for which a Perry unit is not available.

In the August '76 Engine Clinic, I answered a letter from a modeler in Canada who wanted to know if it was okay to use Castrol Two Stroke Motorcycle oil in model engines. I told him no because the viscosity was too thin for model engine use. This month, I received a letter from Mr. Horst Bau, a Technical Assistant with Burmah-Castrol Canada, Ltd. Mr. Bau did agree that my answer was correct, but asked that I point out that Castrol does market Castrol Super M — a synthetic lubricant specially formulated for model aircraft engines. Mr. Bau wanted to make sure that there was no confusion experienced by Canadian modelers between Castrol Synthetic Two Stroke Motorcycle Oil and Castrol Super M. We do seem to have a large number of Canadian readers judging from the amount of correspondence I receive from our Canadian neighbors. For some reason, the Castrol Super M is not available in the U.S. I have often wondered about this, but letters to both the West and East Coast Castrol distributors went unanswered. Evidently, they do not care to get into the model engine market. This is strange when you consider Castrol sponsors contests in Europe and goes all out to promote the use of their product in model engines both in Europe and Canada.

• •

While on the topic of fuel ingredients, John W. Brodbeck, the 'old man' at K & B, sent in a copy of a Newsgram published in the October '76 Plastics magazine. The National Institute For Occupational Safety And Health (NIOSH) has recommended to OSHA that the latter revise its benzene exposure level standard to permit no worker exposure to benzene "in excess of one part of benzene per million parts of air." NIOSH considers benzene to be a leukemia producing agent and recommends, for regulatory purposes, it is to be considered carcinogenic in man. So you will not have to drag out your dictionary for that two dollar word - - it means Cancer producing. So what's this got to do with model fuel ingredients? Nitro benzene, a relative of benzene, has long been used in model fuels as a mixer. This is the stuff that smells like shoe polish. Prior to the acceptance of synthetic oils, all of our model fuels used castor oil. Nitro methane would not mix with castor oil in percentages much over 50%. The addition of a small percentage of nitro benzene would cause them to mix. Many fuel manufacturers in the past would add a little nitro benzene to their fuel, as it makes analyzing the contents more difficult. (Back in the old days, some of the fuel manufacturers were afraid some other manufacturer might

to page 180





# PRATHER PRODUCTS

## SUPER Silicone Fuel Line

- ★ Fuel Proof
- ★ Resists Kinks
- ★ Won't Get Hard
- ★ Stays Tight on Fittings

Small 49¢ ft. for ½ A's  
 Medium 59¢ ft. for Most Engines  
 Large 69¢ ft. for Fuel Pumps



**USED by the Champions!!!**

- ★ Dave Brown
- ★ Phil Kraft
- ★ Joe Bridi
- ★ Steve Helms

*It's The Best!*

## Shrink Down Tubing

- ★ Holds wire on push rod ends
- ★ Reinforces plug wire ends

Sm. 98¢  
 Lg. \$1.29



# NEW

## Spinner Balancer

- ★ Reduces vibration
- ★ Less engine wear
- ★ Less radio failure
- ★ More RPM



\$7.95

A balanced spinner is just as important as a balanced prop.

## 11" Canopy

\$2.98



Fits Little Toni and other medium size airplanes. This is a deluxe clear canopy with a trim line.



## PRATHER PRODUCTS

1660 RAVENNA AVE., WILMINGTON, CA. 90744



## RECYCLE YOUR OLD PLANE

BY MAJOR MERRELL S. BEEBE

● Tired of looking at the remains of last years plane standing in the corner? Need a back-up ship for this summer? Pull that old airplane out of the corner, blow the dust off and let's make it look like new.

It is amazing how quickly an old airplane can be given a new look. Start by cleaning the plane with a strong soap or cleaner that will cut through any fuel residue. Pay particular attention to the engine compartment and make a mental note as you go if the firewall or motor

mounts need to be repaired. Hardwood beam mounts often crack after a year or two of use. If they are beyond repair, use a razor saw to cut them off and replace with one of the many mounts that can be fastened to the firewall. After the fuselage is thoroughly clean, start filling all nicks and cracks.

Next comes one of the most important steps - - sanding. As in building a new plane, sanding must be thorough. However, this time it won't take nearly as long to get the surface prepared for spraying.

The quickest way to spray paint, since your plane probably already has a good base, is to simply buy a couple of cans of spray dope.

The wing can be refinished in the same manner as the fuselage or, for a new effect, take a razor blade and cut out the covering material from between each wing rib. Then cut a strip of transparent MonoKote type of covering and apply over the ribs. When properly sealed, use a straight edge to cut off the excess MonoKote 1/4" to 1/2" from the opening in the wing panel. Then cut a piece of newspaper and, using masking tape, cover the transparent covering. Fill and sand the remainder of the wing and spray as you did the fuselage.

Plan a liberal use of decals or MonoKote type of trim. Inexpensive star decals, AMA numbers, and trim tape can be used to really make your model stand out.

The refurbishing of the Kaos pictured used the techniques described and took only about six hours effort. The time was divided approximately as follows; .5 hour cleaning, 1 hour repairing front end and filling nicks, 1.5 hours sanding, 1 hour to apply MonoKote, .5 hour to mask areas, 1 hour to spray colored dope (remember — you already have a good base), and .5 hour to apply decals, striping tape, etc.

Don't put it off. Get started, it's easy! □



# Radio Spectrum

JIM ODDINO



● In last month's exciting episode of "How does RC work, without discussing electronics or schematics", we described a so-called digital proportional system and showed how you could have control over a number of fully proportional channels by simply turning the RF carrier on and off at the appropriate time in the transmitter and by performing the required decoding at the receiver end. In addition, we promised to describe the operation of the encoder which is the portion of the RC transmitter that converts your commands into electrical signals that are used to modulate the radio frequency (RF) carrier.

Again this month, we'll try to keep the electronic discussion to a minimum.

Before getting into the encoder, I'd like to briefly describe the RF section of a typical RC transmitter so you can see what it is the encoder is going to have to drive.

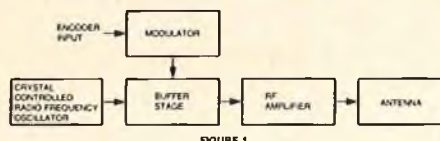


FIGURE 1

Figure 1 is a block diagram of a typical system. RF energy is generated at a precise frequency determined by a quartz crystal in the oscillator section. The output of the oscillator is a voltage that varies in alternating fashion just like your house current except that it is varying at 75.64 million cycles per second (MHz) instead of 60 cycles per second. This voltage is amplified some in the buffer stage and more in the RF amplifier stage before being applied to the antenna where it is radiated into space. The modulator is nothing more than a switch which turns the power to the buffer on and off on command from the encoder. When no power is applied, the buffer cannot amplify the output of the oscillator so no RF power reaches the antenna. The switch must operate at some pretty high rates in our digital system; so an electrical switch, such as a transistor or FET is required. The time it takes the switch to turn on and off is controlled by resistors and capacitors to insure that excessive side bands are not generated.

This might be a good time to stop and

discuss the term "splatter" which many people use to describe someone-else's transmitter that is interfering with their system.

First of all, you must modulate a carrier in some manner, in order to transmit information. You must turn it on and off or vary its frequency or amplitude or phase in order for the receiver to detect that you are trying to tell it something. In our example of directing your wife backing out of the driveway with hand signals, she wouldn't know what to do if you raised your arm and never moved it.

Any time you modulate a carrier, you create side bands. If you vary the amplitude of the carrier in sinusoidal fashion, at say 400 times per second, you would have one side band 400 Hertz (Hz) above the carrier frequency and another 400 Hz below. If you modulate it with a square wave, you create jillions of side bands, depending on the rise and fall times of the square wave. The number and amplitude of the side bands, in a digital RC system, are a function of the repetition rate, pulse widths and rise and fall times. A properly designed system that meets the FCC requirements will have 99% of its output power in a 8 Kiloherzt band around the carrier. The term "splatter" suggests that there are significant side bands outside this band, which are interfering with adjacent RF channels.

Okay, back to the encoder. We want an electrical signal to turn a transistor on and off with a wave form similar to Figure 2 which is similar to the system we described last month.

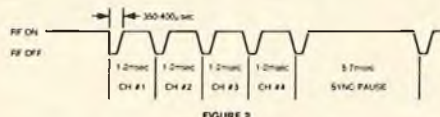


FIGURE 2

Early systems used a series of mono-stable multivibrators arranged in a configuration called a ring counter. Let's discuss the mono-stable multi which is sometimes called a one shot multivibrator. Consider it as a black box as shown in Figure 3 with the following characteristics:

(1) With no trigger applied, the output sits at a voltage  $V_1$ , which is usually close to zero no matter where the input control pot is set. This is called the stable

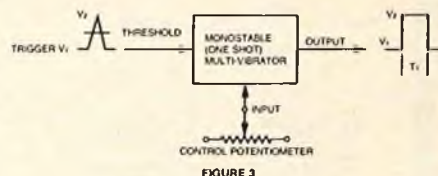


FIGURE 3

condition.

(2) If a trigger is applied, that is the input voltage rises from  $V_1$  to  $V_2$  past some threshold, the output goes to Voltage  $V_2$  and remains there for time  $T_1$  and then returns to voltage  $V_1$  until it is triggered again. This is called the quasi-stable stage. The fall of the trigger voltage from  $V_2$  to  $V_1$  has no effect. The time  $T_1$  is determined by certain components in the circuit, but can be varied by the control pot. In RC circuits, the typical time varies from one to two milliseconds for plus and minus thirty degrees of pot rotation. The ring counter looks like Figure 4. The output of each one shot, triggers the succeeding one shot around and around the ring every twelve milliseconds or so. The timing can best be shown in chart form. See Figure 5.

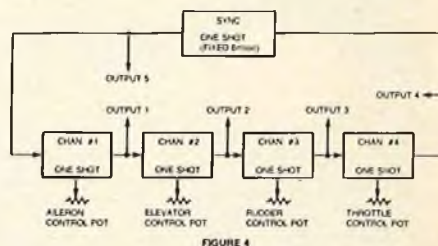


FIGURE 4

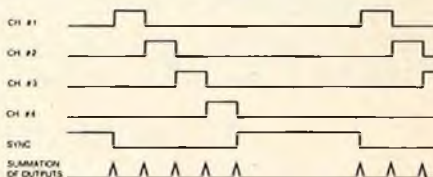


FIGURE 5

If we take the five outputs and pass them through a simple circuit, called a differentiator, which puts out a spike coincident with the positive going leading edge of the pulse, and sum all of these outputs, we get something pretty close to the waveform we are looking for. All we have to do is trigger another one shot which has a fixed 350 to 400 microsecond ( $\mu\text{sec}$ ) quasi-stable state with

to page 18



# THE EASY WAY TO FORGET ABOUT BATTERIES



**SUPER CYCLE WARRANTY REGISTRATION**  
 (Void Unless This Card Returned Within 10 Days of Purchase)

Serial No. **7015-110**

NAME ARNE PEDERSEN

ADDRESS EIK, NORDBY, 1400  
SKI, NORWAY

Date Purchased: JAN 16TH - 1976

Purchased From: AMERICAS HOBBY CENTER

Your comments on SUPER CYCLE are invited ISOLATED  
FAULTY TX CELL ON A BRAND NEW  
RADIO THE FIRST DAY I USED THE  
SUPER CYCLE. SUPER CYCLE ARE INVITED I AM A  
NEW COMER TO MAKING, LET IT  
DOUBLED MY BATTERY LIFE

Your comments on SUPER CYCLE are invited I've  
used it ONE DAY + IT'S REALLY PROBABLY  
SAVED AN AIRPLANE (35 MIN ON MY XMITTER!)

It removes an element of uncertainty from  
 my enjoyment of R/C Flying.  
 I've been invited  
LAST TIME I HAVEN'T WORRIED ABOUT  
HOW MUCH TIME LEFT. - GREAT

Your comments on SUPER CYCLE are invited I've  
Just lost a scale J-3 Cub due to batteries,  
problem was isolated on a friend's Super cycle

Your comments on SUPER CYCLE are invited I've  
FINE PRODUCT, WOULD NOT BE WITHOUT ONE

Your comments on SUPER CYCLE are invited I've  
Every Person in R/C should have  
one

Your comments on SUPER CYCLE are invited I've  
Works great, best idea in years. Pays for itself +  
would say if you prevent one accident.

Your comments on SUPER CYCLE are invited I've  
I wonder why it took me so  
long to purchase one.

**\$49.95**

**COMPLETELY UNATTENDED OPERATION!!** The night before you fly, plug in the transmitter and receiver cables as you would with your charger, and press the **SUPER CYCLE** button. The next morning your batteries will be fully charged and the built-in **SUPER CYCLE** timers will tell you the condition of your battery. **FAIL-SAFE** indication tells when batteries are in charge or discharge mode. **ACCURATE** discharge current. **SAFE** charging current. **FULLY GUARANTEED.**

Standard Model: 4.8 volt receiver, 9.6 volt transmitter, 115V 60 cycle (8 or 12 volt transmitter voltages available on special order only), 220V 50-60 cycle model available for foreign use. Be sure to specify model desired when ordering (\$51.45). Please add \$1.50 postage & handling. NYS residents add sales tax.

**ELECTROSTAR SYSTEMS INC.**

116 Toledo Street, Farmingdale, N.Y. 11735 — (516) 752-9100

## RADIO SPECTRUM

from page 16

the summed output. This last one shot may do the actual switching of power to the buffer and it may contain the necessary shaping components to minimize excessive side bands.

The ring counter, as shown, has certain drawbacks such as unreliable starting and complete failure if the loop is opened at any point. Most manufacturers have corrected these problems by either adding a free running multivibrator clock which produces a fixed frame rate or providing a circuit which will clock the string of multi's in case the loop is opened.

In previous articles, you may remember me referring to a standard "half shot" type encoder. The original RC encoders used two transistor one shots, so when Don Mathes figured out how to do the same function with one transistor, the term "half shot" was coined. Don's circuit has been the standard of the industry until recent years and is still used in many of the present day systems.

Well, hopefully, you guys are learning enough that you can "talk smart" about how RC works and notice I haven't shown any schematics.

★ ★

Last month, we discussed the possibility of the six meter interference at Dayton, being due to amateur radio repeaters. I imagine many of you said thank goodness I don't live in that part of the country. Well, don't get to comfortable because you're going to hear more and more about repeaters in all parts of the country. The good news is that the amateur radio people are rational thinkers and have developed a plan that takes model airplane frequencies into consideration. The following info was sent in by Ken Kern — K9BEH of Bedford, Indiana:

### 6-Meter Plan

The six-meter band plan instituted a little over two years ago, has been receiving increasingly greater acceptance. Basically, the plan calls for input/output separation of 1000 kHz with 20-kHz channel spacing. Certain reserve frequencies are listed to provide guard channels for model radio control frequencies. Recent VRAC proposals call for additional direct frequencies and recommend that 52.95, 52.99, and 53.01 MHz be set aside for these purposes.

### 500 MHz BAND PLAN

1000 kHz Spacing: 20 kHz Channels

DIRECT	REPEATER	RESERVE
	INPUT/OUTPUT	
	52.03/53.03	
	52.05/53.05	
	52.07/53.07	



	52.09/53.09
	52.11/53.11
52.13/53.13	
52.15/53.15	
52.17/53.17	
	52.19/53.19
	52.21/53.21
52.23/53.23	
52.25/53.25	
52.27/53.27	
	52.29/53.29
	52.31/53.31
52.33/53.33	
52.35/53.35	
52.37/53.37	
	52.39/53.39
	52.41/53.41
52.43/53.43	
52.45/53.45	
52.47/53.47	
52.49	52.49
52.51	53.51
52.525 NDF*	
	52.55/53.55
52.57	52.57/53.57
52.59	52.59/53.59
	52.61/53.61
53.01	52.63/53.63
	52.65/53.65
	52.67/53.67
	52.69/53.69
	52.71/53.71

\* The reserve frequencies listed are guard channels for the model radio control frequencies, every 100 kHz from 53.1 through 53.8 MHz. In the event that additional repeater channels are needed, these reserve channels could be allocated. For the present, it is suggested that frequency coordinators do not assign these channels.

\* Notional Direct Frequency.

You can see that the plan is to use the 53 to 54 MHz portion of the band which we thought would always be free for RC use, due to the fact the hams want to be careful not to cause television interference. However, the repeater can be carefully controlled and TVI will not be a problem. So I think we better be ready to live with it.

What effect will it have? Well, you notice the guard bands they are recommending are only plus and minus 30 KHz, which is considerably less than the 80 KHz spacing we have on 72 MHz band. The reserve frequencies are even worse with only a 10 KHz guard band. The net result means we'll have to have better receivers to exist in this environment. The saving factor is that all of these frequencies will not be used in all parts of the country. What the individual will have to do is find out what repeater frequencies are used in his area. The problem for the contest flyer who travels, is a little more complicated.

When checking for compatibility of your system with the repeater — don't forget the image frequency. This requires that you know if your local oscillator crystal is above or below your transmitter frequency. For instance, I fly on 53.1 and my receiver crystal is on the

to page 175

# SAILAIRE

**OVERALL WINNER OF THE 1976 SOAR NATS**

CRAFT-AIR designs had some other distinctions at the 1976 SOAR NATS

- 1st Place Overall
- 1st Place Duration, Class C
- 2nd Place Precision, Class C
- 1st Place Duration, Class A
- 1st Place Precision, Class A
- 1st Place Team Trophy

Designed as a competition thermal sailplane, we believe SAILAIRE is the highest performance sailplane available. SAILAIRE will fly inverted, roll, loop, and penetrate upwind, yet will float with the lightest of them. Science doesn't know how to measure the L/D of the R/C sailplanes, but if it did, SAILAIRE would surely win the honors.

Wing Span 150 Inches  
Wing Area 1643 in.<sup>2</sup>  
Flying Weight 5.3 lbs. to 11 lbs.  
Lifting Surface 1931 in.<sup>2</sup>  
Airfoil Craft Air, 12% flat bottom  
Wing Loading 7.4 to 15.4 oz./ft.<sup>2</sup>  
Surface Loading 6.3 to 13.1 oz./ft.<sup>2</sup>  
L/D (estimated) Over 20:1  
L/D w/spoilers deployed 3:1

• MACHINE SANDED RIBS  
• FIBERGLASS FORWARD FUSELAGE  
• ROLLED PLYWOOD TAIL CONE

• ALL HARDWARE  
• CONTROL RODS

SP-5 \$129.95

Although SAILAIRE is a very large R/C sailplane, its handling characteristics are similar to those of the 100" WINDRIFTER, with the precision landing capability and ease of handling not found in any other large R/C sailplane.

NEVER BEFORE HAS A SAILPLANE WON SO MANY TROPHIES IN SUCH A SHORT TIME

Wing Span ..... 99.3 in.  
Wing Area ..... 916 sq. in.  
Lifting Surface ..... 1051 sq. in.  
Surface Loading ..... 5 oz./sq. ft.

Now with plywood reinforced fuselage

NEW!  
Optional Spoiler Kit SP-325 — \$3.95

• DELUXE QUALITY KIT  
• PRECISION MACHINE SANDED RIBS  
• ALL HARDWARE INCLUDED

THE FORGIVINGNESS THAT MAKES WINDRIFTER A WINNER — MAKES WINDRIFTER EASY TO FLY.

Wing Span ..... 99.8 in.  
Wing Area ..... 903 sq. in.  
Lifting Surface ..... 1042 sq. in.  
Wing Loading ..... 6.38 oz./ft.<sup>2</sup>  
Flying Weight ..... 40 oz.  
Airfoil ..... CRAFT-AIR WINDRIFTER  
\*Without ballast. Up to 4 lbs. ballast may be added.

WE'VE MADE THE BEST EVEN BETTER!

## WINDRIFTER SD 100

NEW!  
Optional Spoiler Kit SP-325 — \$3.95

Superb Thermal Performance (second to none)  
Indestructible (almost) Fuselage  
Made of a plastic new to model aviation: ASA, lighter than fiberglass, bonds with most cements, takes any paint.

BALANCED RUDDER  
FULL FLYING STABILIZER  
PLUG-IN WING AND STABILIZER  
SYMMETRICAL AIRFOIL TAIL SURFACES  
COMPLETE HARDWARE INCLUDED

IDEAL R/C TRAINER  
EASY TO BUILD  
EASY TO FLY

With so many machined parts and such DETAILED INSTRUCTIONS, to fail would require DESTRUCTIVE INGENUITY.

KIT INCLUDES ALL HARDWARE

Wing Span ..... 72 in.  
Wing Area ..... 480 in.<sup>2</sup>  
Weight ..... 20 oz.  
Wing Loading ..... 6 oz./ft.<sup>2</sup>

SP-1 \$24.95

### DUAL RANGE Expanded Scale Voltmeter

THE ONLY DEVICE WHICH ALLOWS PILOT TO PREDICT SAFE FLIGHT TIME AVAILABLE FROM RECEIVER AND TRANSMITTER NI-CADS.

• Know how much safe flight time is available before each flight.  
• Know the voltage available to the receiver and transmitter.  
• Know the condition of the airborne battery.  
• Know the condition of the transmitter battery.  
• Plot a characteristic voltage vs time curve at simulated load.  
• Cycle the batteries to prevent memory.  
• Detect shorted or weak cells before it's too late.  
• Use the meter on any 4-cell (4.8 volt) Ni-Cad battery.  
• Use the meter on any 8-cell (9.6 volt) Ni-Cad battery.

BUILT-IN LOAD SIMULATES NORMAL AVERAGE FLIGHT BATTERY LOAD

RUGGED BAKELITE CASE FOR FIELD OR SHOP USE

1 YEAR GUARANTEE

VM-2 \$19.95

### HI-STARTS

• CONVENIENT CUSTOM REEL  
• ONE PIECE SURGICAL LATEX TUBING  
• NYLON TOW LINE  
• STRONG, LIGHT PARACHUTE  
• STEEL STAKE  
• STEEL TOW RING  
• STRONG, STEADY POWER  
• EASY TO LAY OUT  
• EASY TO RETRIEVE  
• EASY TO STOW  
• EASY TO STORE

Standard Class  
Deluxe Hi-Start HS-1 \$34.95  
Generally for sailplanes with wing spans of 100" or less.

Heavy Duty  
Deluxe Hi-Start HS-2 \$39.95  
Generally for sailplanes with wing spans of 90" or more.

### PARA-POD

• A LAUNCHING POD THAT DROPS OFF WHEN THE ENGINE STOPS, AND COMES DOWN ON ITS OWN PARACHUTE.  
• FITS ALL SAILPLANES UP TO 10 FT. WING SPAN.  
• AUTOMATIC DROP OR COMMAND DROP (3RD CHANNEL NOT REQUIRED)  
• TAKES ENGINES UP TO .15 CU. IN.  
• LOW ENGINE POWER REQUIREMENTS (.049 TAKES 2 LB. GLIDER 800)  
• INCLUDES PARACHUTE

PP-3 \$9.95

HI-START PARACHUTE — PP-1 5.95

Craft-Air

5901 OAKDALE AVENUE • WOODLAND HILLS, CALIFORNIA 91367  
PHONE (213) 340-2114



# Racing At Random

FRED REESE & DON DOMBROWSKI



*A Dumas fiberglass Deep Vee 60 built by George Lanese.*

● To follow up our article last month, we went to the N.A.M.B.A. rule book to get some information on what determines the varying classes in R/C Boat Racing.

## Engine Classification

1. Internal Combustion
  - 0-3.50cc (0-.21 cu. in.) Class A
  - 3.51-7.55cc (.22-.45 cu. in.) Class B
  - 7.51-11.00cc (.46-.67 cu. in.) Class C
2. Electric
  - 0-12 volts measured at battery terminal Class E. 12-00 volts measured at battery terminal Class F.

## Hull Classification

1. Mono Plane
  - a. A hull which has no surface or edge lower than the keel line and has no discontinuities between or steps in the wetted surfaces. Ref. The Norco Eaglet is a typical Mono type design.
2. Hydroplane
  - a. If a hull does not qualify as a Mono Plane hull, it automatically goes into the Hydroplane class. Ref. Octuras Models Wing Ding is a typical Hydro Hull.
3. Deep Vee
  - a. Hull must be Stand-Off Scale profile and appearance as presently used in Class V and VI off shore racing such as Cigarette, Magnum, Betram, Monza, Formula Donzi, etc.



*Jim Whittlatch took top honors in C Hydro with his Octura Models Wing Ding.*



*Jack Garcia's K & B 3.5 powered a Mono Norco Eaglet.*

- b. Angle at bottom of keel line in the center of the boat must be a V extending forward from transom to bow with no flat pads allowed at V keel line.
- c. Angle of V bottom must be 16 degrees minimum to 28 degrees maximum at transom measured from the water line. Ref. Dumas Boats CF 60 is a typical Deep Vee Hull.

If further information and specs are desired, we recommend that you contact N.A.M.B.A. International: Myrtle B. Boad, Sec., Rt. A, Box 19, Lower Lake, California 95457, or I.M.B.A., 24310 Prairie Lane, Warren, Mich. 48089.

We hope that the above information, along with what we mentioned in our last article, will help someone who is interested in boating, but didn't know where to go for the right information.



*Terry Prather, John McDermott, and Jim Jensen, the top three Formula I winners at the N.M.P.R.A. Championship held at Bakersfield, California.*

The N.M.P.R.A. Q.M. Championship race was held at Rough River, Kentucky. Hospitality is a big thing in this state. When you combine it with fantastic facilities, terrific people and Quarter Midget racing, you can see why the



event is always booked up early and why some people already have their 1977 reservations made. Forty-seven Quarter Midget racers from a dozen different states met to determine the National N.M.P.R.A. Quarter Midget Champion. Bringing the Quarter Midget Championship on a par with the Formula I Championships, one step at a time, the N.M.P.R.A. decided to hold its first Quarter Midget Championship concurrently with one of the most prestigious Quarter Midget meets in the country. Next year the only people eligible to compete in the N.M.P.R.A. Q.M. Championships will be N.M.P.R.A. members.

The top 10 were all N.M.P.R.A. members which speaks well of the general flying capabilities of the N.M.P.R.A. membership in general. The fastest time of the meet 1:35 was turned by Bobby Blouch — congratulations, Bobby. The top ten finishers were as follows.

- |                  |                   |
|------------------|-------------------|
| 1. Bob Reuther   | 6. Greg Doe       |
| 2. Gail Jacobson | 7. Len Wiederhoft |
| 3. Bill Hager    | 8. Bobby Blouch   |
| 4. Tom Moore     | 9. Ben Martin     |
| 5. Al Grove      | 10. Allen Bouta   |

We will have a more detailed report on the Rough River Q.M. Championships in a following issue.

The N.M.P.R.A. Formula I Champion-  
to page 170



*Steve Sica with his X-40 powered D & S Models Rickey Rat turned the fastest time of 1:15 at Bakersfield.*



# For Old Time's Sake

RANDY CARMAN



**Harry Hillman of Arizona shows off the bare bones of his latest old timer, the venerable Clipper, which he plans to power with a Brown "D" that he's had since 1939!**

## '77 Champs Are Coming!

Talk about advanced planning! The '77 Champs are already on the drawing board! The SAM Western V.P., John Pond, has appointed Al Hellman as Contest Manager, Gene Wallock as Free Flight Contest Director, and Tom Bristol as R/C Contest Director. The site was a toss-up between Taft and Las Vegas, and after an informal "Pond Poll", Las Vegas was selected — start savin' your quarters! Although Taft would have

been a perfect flying site, the dearth of accommodations was the key factor in choosing Las Vegas.

The dates have been designed to hopefully keep the fliers from collapsing due to the scorching Nevada summer — Tuesday, June 28th through Thursday, June 30th, with the annual "Bean Feed" on Monday the 27th.

John has instructed Al to secure all necessary accommodations at one of the "strip" motels as well as field accommodations such as tents, eating wagons, and sanitary facilities (yeah!)

Contest applications and reservation forms should be ready for the printer by January 1 and should be in your hands soon after.

Three cheers to John Pond! His initial plans are tremendous and should assure us all of the greatest Champs ever! Let's all pitch in and help make it a grand time for everyone!

## Brace Yourself — More Controversy!

Well, you're all aware of the glow engine to ignition conversion controversy, but are you ready for this one? Lin Haslam of the Salt Lake Antique Modelers (SLAM) has voiced his opinion in his column, SLAM News, in the November issue of the "Dope Bucket", the newsletter of the Utah State Aeromodelers. The following has been excerpted for your edification.

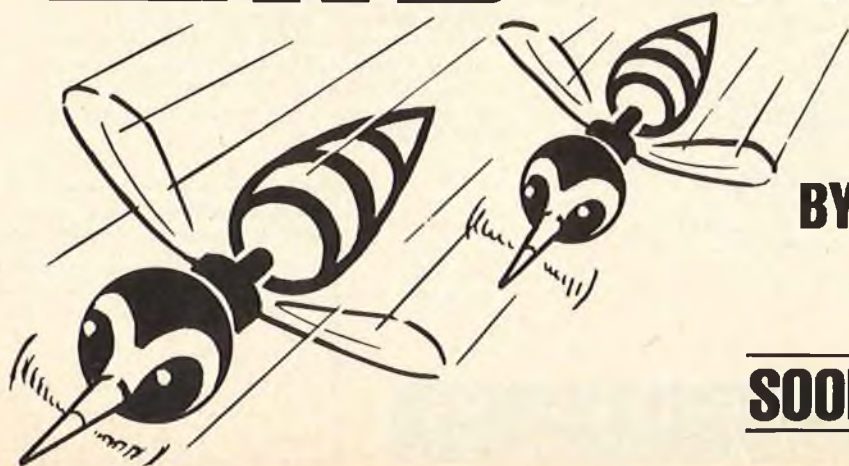
"Another controversial issue has raised its ugly head, due to its over-

whelming performance at the SAM Champs. This is the matter of magnetic-induction ignition systems. This has gotta' be stopped before (sic) it becomes the hot potato that glow conversions have become. As you may know, the glow conversion controversy is, at this writing, threatening to tear the Society of Antique Modelers organization apart. Tim Dannels, probably more than any other man instrumental in the formation of S.A.M., has reportedly resigned from S.A.M. due to the abuse heaped on him as he was acting as chairman of the committee set up to form rules for the use of converted engines. This, and possibly worse, will be the result of allowing modern electronic (sic) technology to become involved in our Old Timer flying. As has been pointed out so many times in recent months, these type of technical advances are in direct violation of the 'state-of-the-art' portion of the S.A.M. 'Official Rule Book' Preamble. This preamble, more than all the verbiage we've read on the subject over the past couple of years, tells in no uncertain terms what the Old Timer movement is all about. We are at the point in time where we have GOT to make up our minds if we are going to allow these trophy-money hungry people, who apparently don't really give-a-damn about O.T. as such, but only another event turned into hot-rod-drag-race to the sky,

to page 24



THE  **HB** *eees* **ARE COMING**



**TOP QUALITY  
MODEL ENGINES  
BY HELMUT BERNHARDT  
OF W. GERMANY**

**SOON IN THIS COUNTRY**



# GREETINGS for the New Year

## PRICE WILLIAMS DISTRIBUTORS

### Wholesale Mail Order Division

\*FOR ALL YOUR  
FLYING MODEL NEEDS\*

Send for our FREE list of available  
merchandise, specials & close outs.

PRICES SUBJECT TO  
CHANGE W/O NOTICE

### Wrap-up your Christmas Shopping Early!

K & B		Reg.	NOW
6525	61 R/C Ser .75	85.00	49.95
6535	61 R/C W/Perry Pump & Carb	110.00	65.00
8011	40 R/C Frt Rotor	59.00	35.50
8360	40 R/C W/ Perry Pump & Carb	89.50	49.95

### COOL POWER FUEL

5% **3.90**  
10% **4.95**

### WEBRA

1024	61 R/C Speed	84.95
1034	40 R/C Speed	69.95

### ENYA

60	XF Schneurle	133.00	79.95
60	B.B. III TV G8	89.98	52.98
40	R/C TV	64.98	39.95

Miller #2017 Spray Outfit	69.95	39.95
Sullivan Starters STD		19.95
Deluxe		22.95

Lou Andrews 41.95  
— Aeromaster

### Du-Bro

#191 Kwik Fill Fuel Pump	10.50	6.50
Robart - Model Incidence Meter		8.50

### DREMEL

245 Moto-Tool Kit	29.95	20.95
381 Moto-Tool Kit	59.95	41.95

(All other Dremel Tools, Kits & Acc. are  
Available at the same Discount 30%)



First on our list: a  
great big thanks to  
the people who make  
it a pleasure to do  
business! Like you!

### Carl Goldberg Models

Hinge Scotting Kit HSK-1	1.25
Mini-Tote MT-1	4.95
Handi-Tote HT-1	9.95
Tri-Gear Retracts RG-3	14.95
Falcon 56	20.95
SR Falcon	33.95
Skylane 62	33.95

### Top Flite Models

RC-16	P-51 Mustang	39.95
RC-17	P-40 Warhawk	41.95
RC-18	P-39 Airacobra	41.95
RC-19	P-47 Thunder Bolt	47.95
DAE — Power Panels		
MK II		11.95
Dual Range		17.95
Series IV		21.95

(Many other Kits Available at the Same Discount Prices)

### HOW TO ORDER BY MAIL

Write down all the items you want along with  
their stock numbers and prices. Check, money  
order or C.O.D. Call for fast C.O.D. service. We  
pay postage on all prepaid orders. Foreign  
orders, add \$10.00. Excess refunded. Pennsyl-  
vania residents add 6% sales tax.

### PRICE WILLIAMS DISTRIBUTORS

Wholesale Mail Order Division  
3250 Chichester Avenue  
Linwood, Pa. 19061  
215-485-2078

—ALL MAJOR CREDIT CARDS ACCEPTED—

from page 22

turn our beloved Old Timer flying into a mockery. We have our well tested rules to go by, which specifically (sic) prohibit the advancement of the state-of-the-art as the conversion of racing glow engines and electronic ignition present, and if we allow these things to be crammed down our throats any longer, we deserve the fate of extinction of Old Timer activities as it was intended (sic) at the outset to be. There is a spot already allocated for these rule violators, it is in the same area as the popular .020 replica event, listed as 'Section V - Special Events' in the rule book. If these violations of the intent (and specifics) of the basic O.T. rules are needed for the survival of O.T., as some near-sighted proponents would have us believe, they can prove it to us non-believers by holding events for these violations of 'true Old Timers' as a 'special events' rather than prostituting the pure events. I am particularly (sic) upset personally by the fostering of these 'violations' by John Pond in 'Plug Sparks'. John, some time back, pushed the conversion of schneurle (sic) port Torp. 40's to ignition and in the latest issue of 'Model Builder' is beating the drum for electronic ignition systems. Come on John, I know you're not interested in seeing the demise of O.T. flying, but by fostering this sort of thing you are materially contributing to just that. There is already a movement afoot to form up another organization for 'pure' O.T. flying, and much to the contrary of the recent AMA debacle, this would have an excellent chance of making it. Especially if a stop is not put to the above violations of our S.A.M. Rule Book.

"Wow - - - I didn't intend to get on that 'soap box' here, but it is long overdue in getting said."

Well, Lin, move over; it's our turn on the soap box.

Magnetic induction and transistorized ignitions have been developed with one goal in mind — to eliminate the interference of engine "noise" with R/C equipment. You characters who have all that glorious flying space can't seem to appreciate the fact that fliers in heavily populated areas have to resort to R/C assisted old timers. Sure, the ideal is pure old time free flight with beautifully silked old timers powered by those sput-



Harvey Sellman's 'Spook' photographed at Lake Elsinore, California.





**Bruce McAvlnew with his .35 powered 'Buzzard Bombshell' built from RCM plans.**

tering ignition engines of the early days. If you want pure, why aren't the models built from original kits?!

We agree, old timers should not "hot rod" into the sky, but have you seen a converted engine on transistorized ignition go up like a skyrocket? If you have, let us know; we've never seen one! Sure they don't "putt" like true ignition engines, but neither do they tear up the sky like a souped up Schneurle! No one is trying to cram conversions or transistors down anyone's throat! Neither should the "purists" try to cram their "shlick" down the other fellow's throat! We're all modelers, let's live and let live! Learn from each other! Make fun, not war! We may each have our own "thing", so why not show consideration for the other person. Life's too short to get mixed up in petty squabbles. Let's cool it and let everyone enjoy their hobby, no matter what their bag! 'Nuff said?

#### Contest Results

SAM 21 has been going like a ball of fire! Just received the latest newsletter from that perpetually busy John Pond with the following results from the October 17th SCIF Texaco Contest. Bob Von Konsky really showed 'em how it's done with a 42:14 flight! He performed this amazing feat with his Lanzo after logging a 36:57 flight with his Powerhouse! Sure you weren't equipped with a sniffer, Bob?

The winners of the event were:

1. Bob Von Konsky	Lanzo	42:14
*2. Bob Von Konsky	Powerhouse	36:57
*only one place counts		
2. W. Peterson	Powerhouse	28:33
3. Bill Northrup	Powerhouse	26:09
4. Bob Oslan	Powerhouse	25:16
5. Loren Schmidt	Dallaire	25:08

The R/C portion of the meet was



**Ross Thomas powered his beautiful 'Playboy, Sr.' with a S.T. .35. Flew at Elsinore.**

# You've earned the GLORY.



## Now earn the GOLD!

Sure, it's a very rewarding experience to know you've mastered something. For most it's a long hard road and often a costly one, regardless of what their endeavor might be.

If you've reached that point in R.C. modeling, chances are you've had your share of costly experiences as well as joyous ones. Our point is, now you may take the opportunity to turn that costly, hard earned experience into GOLD. Becoming a Hobby World Rep. in your area is a rewarding way to pursue your pastime. By making use of the contacts you already have, the ability to advise those with less experience and the desire to help you could earn enough to finance your own flying sport, and indeed add some gold to all that glory . . . oh, and also be appreciated for having done so.

Contact Bob Reuther or Tom Moore today and let's talk about Golden Glory.

**BOB REUTHER'S**  
**HOBBY**  
**WORLD**

6602 HIGHWAY 100 • NASHVILLE, TENN. 37205 U.S.A.  
 24 HOURS: DAY (615) 356-1225 • NIGHT (615) 646-9863



# WHAT'S YOUR PLEASURE? TWO TO FOUR POINT EIGHT OR SIX TO TWELVE VOLT OPERATION!



Super  
**MARK II**  
ELECTRIC FUEL PUMP

New "DESIGN IMPROVEMENTS" ARE BUILT INTO  
THE "Super MARK II Electric Fuel Pump"

Design up-dates have been made in the Case, Materials,  
Motor, Pump Seals and Drive Coupling to bring you the  
Finest Electric Fuel Pump ever available .....

**SONIC-TRONICS INC.**

518 Ryers Ave., Chelfenham, Pennsylvania 19012



Red Barrows nine foot span 'Dalaire Sportster' heads skyward.

"heavily entered even outnumbering the free flight counterpart being staged on the same field." See, we can all live together!

Also gleaned from the SAM 21 newsletter were the results of SAM 27's first contest held on October 24th at Sears Point Raceway. Apparently the wind was the culprit when the flying was cut short at 2:00 p.m. Mr. Pond relates: "Best smash-up was the spectacular looping all over the sky by George Gissendanner's Playboy which suffered a radio malfunction at 400 feet and no further signal reception. The wings finally broke and the Playboy came screaming down. One new Tyro Playboy kit coming up!" What a way to attain fame and recognition!

An unusual innovation was the addition of one minute to the contestant's score for a spot landing. Love to know how many were lucky to hit the spot.

The results were:

#### Fuel Allotment (1/8 oz. gas)

1. Don Bekins	Lanzo	16:21
2. John Pond	Dallaire	14:54
3. Ed Wood	Bombshell	12:19
4. R. Cullens	Bombshell	9:56
5. Nick Nickolau	Buccaneer	6:42

#### Limited Engine Run

1. Karl Tulp	Playboy	8:31
2. Don Bekins	Playboy	8:10
3. Nick Sanford	Scram	8:02
4. N. Kell	Playboy	7:56
5. Bill Branchley	Bombshell	7:01

#### .020 Replica

1. Don Bekins	Stratostrack	10:52
2. Don Bekins	Viking	6:50
3. Bill Hooks	Bombshell	6:50
4. Karl Tulp	Clipper 2	2:00

Looks like Don Bekins put in a hard day! Congratulations to all the winners and to SAM 27 for what sounded like a well run contest!

#### Bits and Pieces

We received a very nice letter from Mr. Harry Hillman (see photo) of Oracle, Arizona. He's just getting back into the hobby after a few years lapse to raise a family. He's been busy building that pretty Clipper to fly with R/C assist. He'll need it to fly between the Arizona cactus! We're sure that Harry would appreciate any contact with some Tucson area modelers. If you're of a mind, get in touch with him at P.O. Box 266, Oracle, Arizona 85623.

That's about it for now. Happy landings 'til next time! □

**BE IN THE AIR WHILE OTHERS WAIT.**

With the Heathkit Pack-17™ R/C System's 17 plug-in modules, you'll probably never have to wait for a frequency again!

Spend more time aloft, less time waiting. With Pack-17, there are 17 quick-change modules available, so you can switch to a vacant frequency instantly. And because you build the system, you can service it yourself. Units are available with 3, 5 or 8 channels, single or dual stick transmitters. Send for the new Heathkit catalog and see the complete Heath R/C line... it's the only way to fly.



**FREE!**

Send for your copy today.  
The world's largest catalog of electronic kits. Nearly 400 money-saving kits you can build.



Heath Company, Dept. 83-26, Benton Harbor, MI 49022

HEATH Schlumberger		Heath Company, Dept. 83-26 Benton Harbor, MI 49022	
Yes, please rush my FREE Heathkit Catalog! I am not already on your mailing list.			
Name _____			
Address _____			
City _____	State _____		
RC-125 _____	Zip _____		



## READ WHAT DAVE PLATT HAS TO SAY ABOUT TWO REMARKABLE NEW PRODUCTS FROM PICA

...“Fillit, mixed with resin, proved to be the easiest-to-sand filler I’ve ever used. Even large wing fillets cut down quickly and smoothly. And with the pouring spout, it’s much easier to measure and mix.”

...“Despite several claims, I hadn’t encountered a white glue that is truly sandable. Well, Gluit does sand easily while maintaining all the strength one expects of a white glue... and it sets faster than any aliphatic glue I have ever used.”

Look for Fillit and Gluit at your hobby shop or write: Pica Products, 2657 Northeast 188 St., Miami, Florida 33180.



INNOVATIONS  
IN MODELING



Distributor Inquiries Invited

## Soaring

AL KINDRICK

● The U.S. F.A.I. RC Team selection has been sent in by Jim Simpson, Program Manager.

LeMon Payne from Dallas, Texas, won First Place in the U.S. FAI Radio Control Soaring Team selection finals at Denver, Colorado, over the Labor Day weekend in 1976. He flew a Legionair 140 sailplane with a Royal radio and scored 9714.3 points out of a possible 12,000 total points. Skip Miller from Boulder, Colorado, was Second flying an Aquila sailplane with an EK-logictrol radio. Skip scored a total of 9581 points, which is really great considering Skip has been in RC soaring only one year.

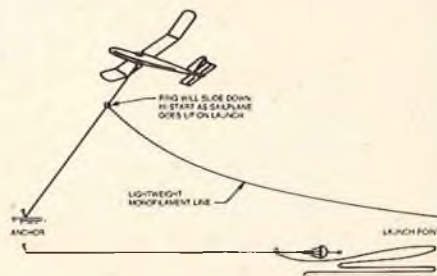
Dale Nutter, who hails from Tulsa, Oklahoma, laid claim to Third Place by gathering 9104.3 points. He flew a Grand Esprit sailplane with an EK-logictrol radio. Like LeMon, Dale has flown RC sailplanes for years and years.

These three men are the primary members of a team which will represent the United States in world competition scheduled over Easter weekend 1977 in South Africa. If, for any reason, a primary member cannot go, the next man down in the final standings will take his place.

The first three alternates listed in descending order are: Dave Thornburg, Jim Wiseman, and John GunSaullus. Dave recently moved from New Mexico to California, which is also Jim's home state. John is from Florida.

There were 39 contestants competing for these positions over a three day period, in near perfect, high altitude weather. The contest was hosted by the Rocky Mountain Soaring Association and the crew of 29 officials and score keepers, headed by Ray Marvin, represented several of the Denver area clubs. Their efforts and abilities were appreciated by all concerned.

This event capped a year of activity which was sanctioned by the Academy of Model Aeronautics, directed by the National Soaring Society, and managed by Jim Simpson. The competition was open to all RC sailplane pilots and began with 27 local contests which were conducted during May 1976. The local winners moved to six regional semi-finals which were conducted over the Fourth of July weekend, and only a few of these qualified to participate in the finals.



Roy Inmen sent in a suggestion for retrieving the hi-start when flying alone and, especially, if you are using the hi-start for night flying. Attach a light weight monofilament line to a 1" diameter ring. Slip the high start through this ring and launch in a conventional manner. As the sailplane goes up, this ring will slip down the high start with no apparent friction. After the flight, the light weight monofilament line is pulled in. The 1" ring will slip up the line to the parachute. In a very short time, and with no additional walking around the field searching for the chute, the hi-start is ready for another flight.

Retrieve the hi-start from the launch point by pulling in the monofilament line. The ring will catch on the parachute and stretch the hi-start back to the pilot at the launch point. There has been no apparent loss of launch height with this attachment.



**Heathkit Electronics stop watch with sunscreen in place. Good sunlight viewing.**

These past few months we have had the opportunity to use the Heathkit programmable stop watch. A function switch selects the timing mode, and a reset button returns the count to zero. The start/stop and final stop switches are conveyed to page 166







One of the most popular dramatic series to be aired during the 1976 television season, was Baa Baa Black Sheep, a fact-based story of a highly decorated maverick air ace of World War II and his motley selection of fighter pilots who break every rule in the book except one --- fight to win.

Aired on Tuesday evenings by the NBC Television Network, the series has been inspired by the chronicle of these adventures, the book "Baa Baa Black Sheep," written by the man who lived them, Marine Air Corp Major Gregory "Pappy" Boyington. Starring in the series as Boyington is rugged Robert Conrad, star or co-star of the series "Wild Wild West," "Hawaiian Eye" and "The D.A."

Not long after Pearl Harbor, Boyington was commissioned as a Lieutenant in the Marine Air Corp, but soon wangles a major's commission, based on his experience as a successful combat pilot with General Chennault's "Flying Tigers" in China.

Boyington's rule-busting ways soon get him into hot water with his superiors, but, despite their opposition, he manages to fashion a squadron of odd-ball, but effective, pilots from a pool of misfits — the "Black Sheep." Among those portraying these roles are Dirk Blocker, son of the late Dan Blocker; Rogert Ginty; John Larroquette; W.K. Stratton; and James Whitmore Jr., son of the stage and screen star. Appearing as the squadron's superior officers are Simon Oakland as General Moore and Dana Elcar as Colonel Lard. Stephen J. Cannell created the series and is the Executive Producer, while Phil DeGuere is the Producer.

Filmed in Southern California at Indian Dunes, near Valencia, this new series, besides being outstanding in the portrayal of the Marine Corps greatest World War II Ace, is intensely interesting and humorous with outstanding action and an authentic portrayal of "Pappy" Boyington by Robert Conrad, as well as excellent performances by the supporting cast. This series is also extremely appealing to aviation buffs, as well as the radio control enthusiasts, due to the fact that Universal Studios has gone to great effort and expense to obtain the aircraft utilized in the series as well as the realistic settings you will see in each weeks segment of Baa Baa Black Sheep. Five F4U Corsairs have been brought in from different parts of the country, along with their owners or pilots, by the coordination efforts of noted stunt pilot Frank Tallman. The Japanese "Zeros" are actually AT-6's due to the scarcity of the World War II Japanese fighter. The camera plane is Frank Tallman's own B-25 which has been modified to accommodate the camera equipment.

# BAA, BAA, BLACK SHEEP

BY DON DEWEY

*Photo below, and on opposite page, of Robert Conrad in his starring role as Major Gregory 'Pappy' Boyington.*





With regards to the support aircraft, the AT6's are the same ones that were disguised as "Zero's" for use in the movie "Tora Tora Tora" produced by 20th Century Fox. Some of the other Japanese aircraft came from the Confederate Air Force in Harlingen, Texas, while Frank Tallman himself provided one Zero and another was provided by a local owner-pilot. The six Corsairs used could not be simulated due to the unusual configuration of the famous World War II aircraft and, fortunately, there were still a few of the F4U-4's available in different parts of the United States owned by individual collectors and brought together for the production of *Baa Baa Black Sheep* by Frank Tallman. As previously mentioned, both the Japanese and American ground footage is shot at the production location in Indian Dunes, while the beach and sea footage was shot in the Santa Barbara Channel in Southern California.

"Pappy" Boyington, himself, is the Technical Advisor for the series which adds to the realism and authenticity of the Universal City production aired over the NBC network. Colonel Gregory "Pappy" Boyington, was credited with the destruction of 28 Japanese aircraft during World War II and was awarded the Congressional Medal of Honor "for

extraordinary heroism above and beyond the call of duty" while in command of a Marine Fighting Squadron in the Central Solomons Area of the Pacific from September 12, 1943 to January 3, 1944. He was shot down over Rabaul on January 3, 1944 and his capture by the Japanese was followed by 20 months as a prisoner of war. While still a prisoner of the Japanese, he was selected for temporary promotion from Major to the rank of Lieutenant Colonel.

In mid-August 1945, the atom bomb was unleashed upon Japan and the Japanese forces surrendered. Major Boyington was freed from Japanese custody at Omori Prison Camp in the Tokyo area on August 29th and arrived in the United States shortly afterwards.

On September 6, 1945, the top Marine Corps Ace accepted his temporary commission as a Lieutenant Colonel in the Marine Corp. In addition, at the time of his release, it was confirmed that Colonel Boyington had accounted for two Japanese planes on Jan. 3rd before he, himself, was shot down, bringing his total to 28 Japanese aircraft.

Shortly after his return to the United States, Colonel Boyington was ordered to Washington, D.C. to receive this country's highest honor, the Medal of Honor, from President Harry Truman.

Actually, the award had been authorized by the late President Franklin D. Roosevelt in March 1944 and held in the Capitol until such time as Colonel Boyington was able to receive it. On October 5, 1945 he, together with a number of other Marines and Naval personnel, appeared at the White House and was decorated by the President. On the previous day, he was presented the Navy Cross by the Commandant of the Marine Corps for the ace's heroic achievements on the day he was listed as missing in action.

Following the receipt of the Congressional Medal of Honor and the Navy Cross, Colonel Boyington made a Victory Bond tour. He was later directed to report to the Commanding General, Marine Air West Coast, Marine Corp Air Depot, at Miramar in San Diego, California. Colonel Boyington was retired from the Marine Corp on August 1, 1947, at which time, in addition to the Medal of Honor and Navy Cross, he held the American Defense Service Medal, Asiatic-Pacific Campaign Medal, and the World War II Victory Medal.

Gregory Boyington was born at Coeur d'Alene, Idaho on December 4, 1912. He graduated from Lincoln High School in Tacoma, Washington, and majored in aeronautical engineering at the Univer-

*One of the F4U Corsairs used in the filming of the series. A tremendous coordination effort by noted pilot, Frank Tallman.*





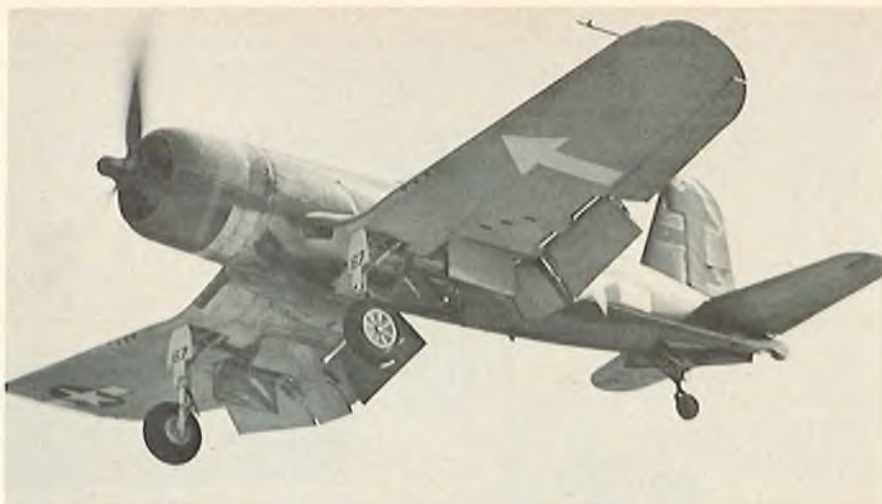
sity of Washington, graduating in 1934 with a Bachelor of Science Degree. Always an athlete, he was a member of the College wrestling and swimming teams, and was a one-time holder of the Pacific Northwest Intercollegiate middle-weight wrestling title.

The famous World War II ace started his military career while still attending college. As a member of the Reserve Officers Training Corp for four years, he became a Cadet Captain. He was commissioned a Second Lieutenant in the Coast Artillery Reserve in June 1934. On June 13, 1935, he enlisted in the Volunteer Marine Corp Reserve and went on active duty on that date and returned to inactive duty status on July 16. Prior to his appointment as an Aviation Cadet in the Marine Corp Reserve, Gregory Boyington had become a draftsman and engineer for the Boeing Aircraft Company of Seattle, Washington. After his appointment, he was assigned to the Naval Air Station, Pensacola, Florida for flight training. This was followed by his designation as a Naval Aviator in 1937, at which time he was transferred to Quantico, Virginia for duty with Aircraft O1, Fleet Marine Force. He was discharged from the Marine Corp Reserve on July 1, 1937 in order to accept a Second Lieutenants commission in the regular Marine Corps the following day.

In 1938, Lieutenant Boyington was transferred to the Second Marine Aircraft Group at the San Diego NAS where he took part in fleet maneuvers on the aircraft carriers USS Lexington and USS Yorktown. After his promotion to First Lieutenant, Boyington resigned his commission in the Marine Corps on August 26, 1941 to accept a position with the Central Aircraft Manufacturing Company. This was the civilian organization formed for the protection of the Burma Road in China. The unit later became known as the American Volunteer Group, the famed "Flying Tigers", under the direction of General Chennault. During his months with the "Flying Tigers", Boyington became a squadron commander and shot down six Japanese planes to secure an appreciable lead over other American aces who didn't get into the fight until after December 7, 1941. "Pappy" Boyington flew three hundred hours before the "Flying Tigers" were disbanded.

After the dissolution of the AVG, Gregory Boyington returned to the United States in July, 1942 and accepted a First Lieutenants commission in the Marine Corp Reserve on September 29th. He reported for active duty at the Naval Air Station in San Diego on November 23, 1942 and was assigned to the Marine Aircraft Wings, Pacific. The following day, he was temporarily promoted to Major in the Reserve and, within two

to page 166



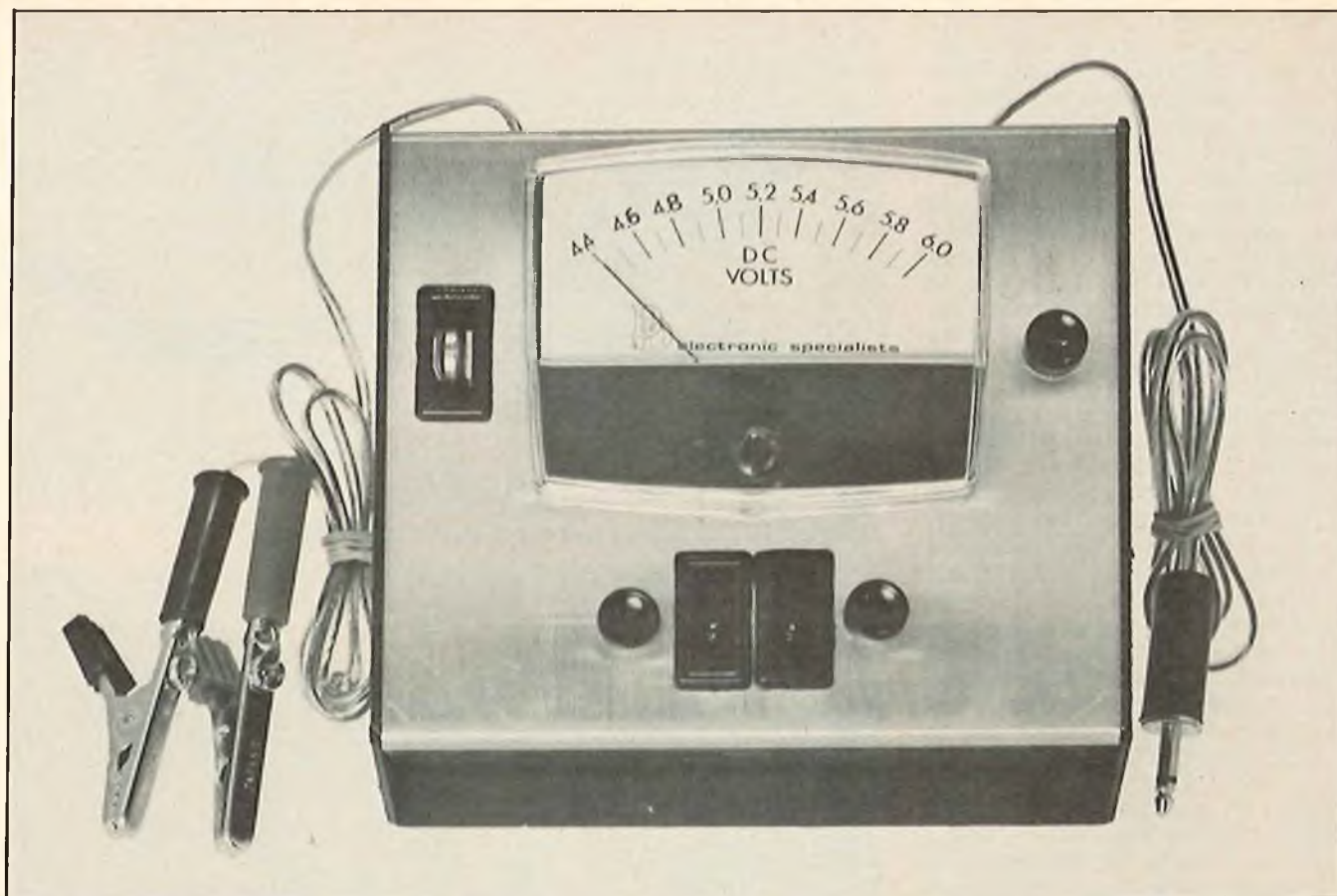
**ABOVE AND BELOW:** Two of the Corsairs during filming.



**BELOW:** Universal Studios film crew shooting a C-47 at Indian Dunes.







BUILDING THE

BY DOUG SPRENG

## RCM BATTERY MANAGEMENT SYSTEM

● *The East Side Bowery Boys demanded that I write this article in language they could understand. They complained vigorously about last month's article on op-amps. One of them went to his local Radio Shack store and asked for "one of those little three wire triangles." He was last seen being dragged away kicking and screaming that he was the editor of a famous magazine and resented being treated this way. He wasn't very convincing. That peculiar jacket he was wearing kept him from gesturing. You should have seen him trying to type me a threatening letter with his toes. This is why he never appears in public — his restraining jacket doesn't allow him to shake hands!*

### What Does It Do?

The Expanded Scale Voltmeter (E.S.V.) has obvious advantages over a normal voltmeter. Its accuracy, however, is compromised when mechanized by the traditional series resistor-zener diode. Not only is calibration required, but its calibration is affected by temperature. It is an obvious asset to have 1% accuracy over the whole scale and not require any calibration adjustment. This may be realized by using a stable mercuric oxide reference cell in conjunction with 1% resistors. This, in conjunction with drift-free, stable operation amplifiers, make it all possible.

To measure the capacity of a Nicad battery in milliampere hours (MAH) requires first that the pack be fully charged, then discharged at a certain current (rate) to the cut-off voltage (1.1 volts per cell). If the pack delivers 500 milliamperes for one hour until the cut-off voltage is reached, it has a capacity of 500 MAH.

Referring to Figure 1, it is seen that the G.E. high rate cells deliver an average of 485 ma for over 60 minutes. This indicates a healthy pack. A faulty cell, or old pack with many cycles of use, will show less than an hour. In fact, if it discharges in only one half hour, it has a capacity of only approximately half of what it should be. This battery should be retired before it causes a crash. If the modeler will run a curve on his battery, he can tell not only what shape it is in, but also how many

minutes of flying time remain. If the voltage under load indicates 4.7 or less, the battery may be recharged to a safe value by connecting the ESV to any 12 volt lead acid or gel cell (motorcycle battery or even auto battery) and pushing the recharge button. If the weather isn't too hot, the charger will terminate automatically at about 95% charge (more about temperature later). The ESV is powered by the RX battery and requires no other power source, except for recharging, other than the mercuric oxide reference source which should last over a year since practically no current is drawn from it.

### How To Use It

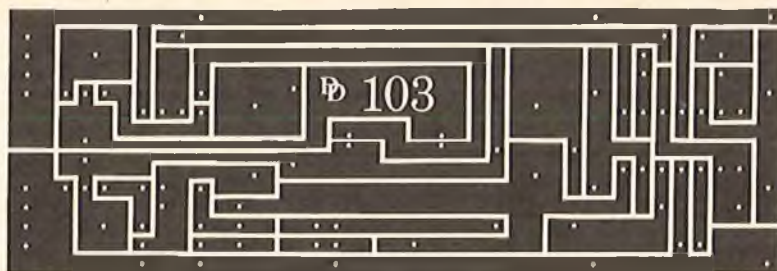
Very carefully — unless, of course, you are one of the "Bowery Boys". No hope for them — there hasn't been for years. They need an operating manual to use a knife and fork. It is fun watching them eat with their fingers. They are convinced that a doggie bag is an ugly bitchy wife! Dewey thinks chop sticks are Chinese hors d'ovres — Mathes claims they are Jimmy Carter toothpicks. Harold Goldclank uses them as chicken sticks and wing hold-down dowels. This debate has been raging wildly these last few weeks and won't be resolved until Pat Crews drags them all to a Chinese restaurant, Dick Tichenor takes pictures, and Dick Kidd draws them a pictorial diagram!

Meanwhile, we shall see how this device is put to work.

Plug the E.S.V. into your charging jack. The meter will indicate the battery voltage under a 25ma load (C/20 for a 500 MAH battery). Pushing the discharge button results in a 500ma load being placed on the battery and the "discharge" L.E.D. will light up. Note the reading on the meter while under discharge, then push the reset button. This will extinguish the L.E.D. and return the current drain to 25ma. Now refer to the battery capacity graph and determine how many minutes remain until the 1.1V per cell (4.4V per pack) cut-off voltage is reached. Remember that, in flight, an average of something less than 500ma will be drawn from the pack. How much less is not really known for sure but experience has shown that perhaps 50% to 75% less is drawn

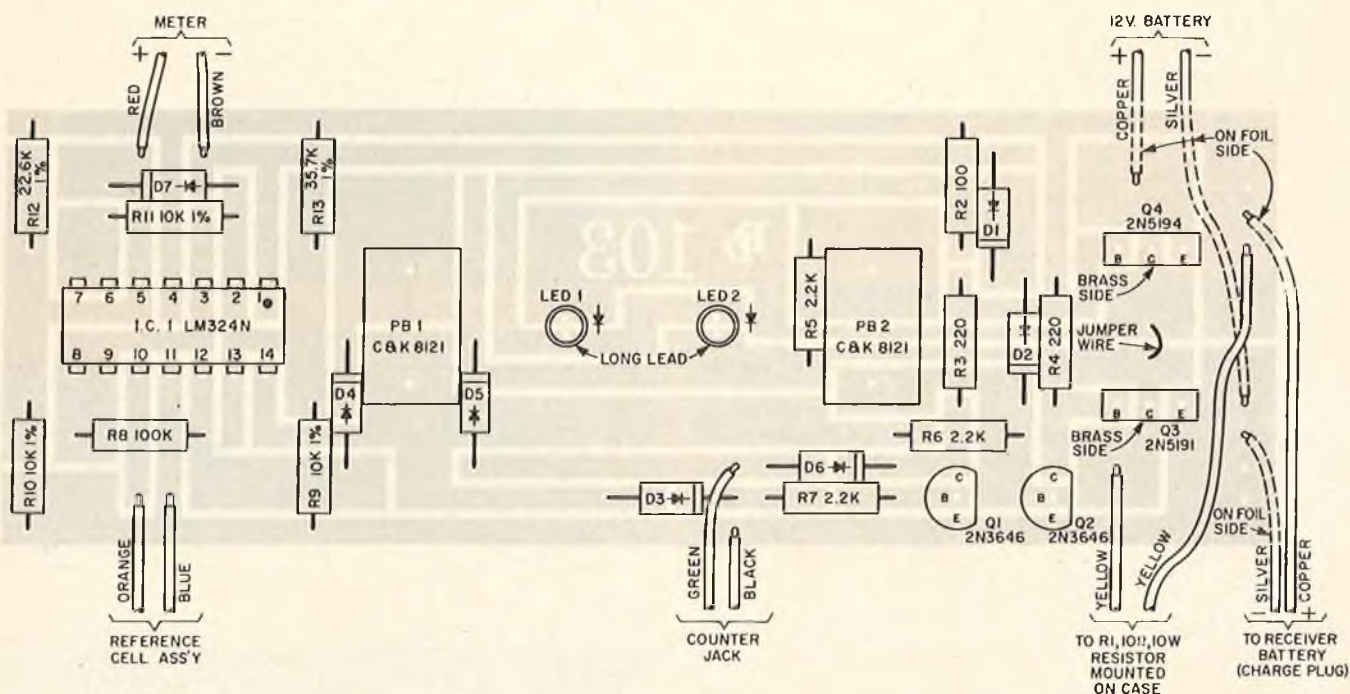
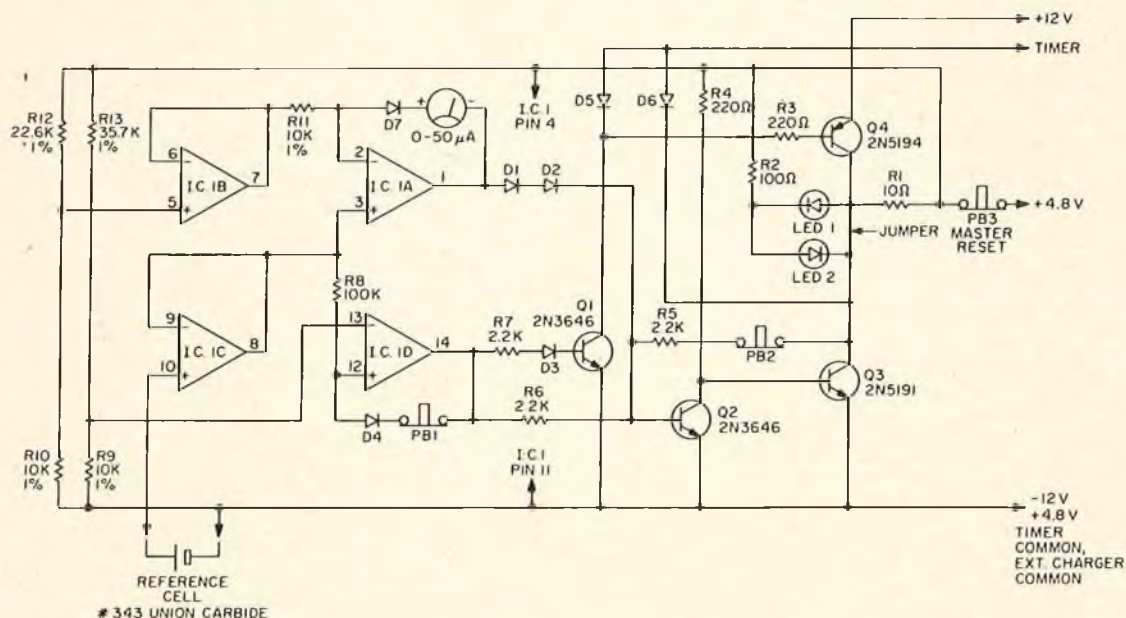


**The RCM Battery Management System is an Expanded Scale Voltmeter with one percent accuracy. It is also a battery discharger and battery field charger with automatic cut-off on both functions. In addition, it determines battery capacity accurately. No calibration is required. Best of all, you can build it from these step-by-step instruction.**



ACTUAL SIZE P/C BOARD (4")

EXPANDED SCALE VOLTMETER/CHARGER/DISCHARGER SCHEMATIC



EXPANDED SCALE VOLTMETER/CHARGER/DISCHARGER COMPONENT OVERLAY



from the pack during a flight. Since the flattest part of the curve is between 4.9 and 4.7V, it would be wise to recharge if the under load voltage is 4.7V or less.

To recharge, merely connect the alligator clips to a fully charged 12V cell, motorcycle, or car battery. Upon pushing the charge button the E.S.V. will latch into the charge mode and the meter will indicate something above 5.3V, and the charge L.E.D. will glow. The charge will continue until the battery reaches 6.169V at which time the charge cycle will automatically terminate, extinguishing the charge indicator and the meter will indicate the battery voltage at the previous 25ma discharge rate. The meter will indicate 5.6V or so which will gradually drop.

If the discharge button is pushed the meter will drop to about 5.0 to 5.2 volts. This shows the battery is near full charge with a 500ma load. Now disconnect the E.S.V. and continue flying. Here's a rule of thumb — charge if the battery under discharge load indicates 4.7 or less. You may terminate the charge by pushing the reset button when the meter reaches 6V or more. Test again by pushing the discharge button. The meter should drop to 5.0 to 5.2 volts in a few seconds, then stabilize. Another technique is to place the battery on charge after every flight which maintains it in a near full charge state by replacing the energy removed during flight. Experience with the E.S.V. will give the flyer an insight as to when and how much charge is needed.

#### Determining Battery Capacity

Using the blank graph supplied with the kit, one may plot a curve which will accurately determine the battery capacity. Proceed as follows:

- 1) Plug in E.S.V. and push the discharge button.
- 2) When the discharge L.E.D. goes out, indicating the cut-off voltage has been reached, recharge the battery with the charger supplied with your system according to the manufacturers instructions.
- 3) Immediately upon charge termination, unplug the manufacturer's charger and plug the E.S.V. in and press the discharge button.
- 4) Note the time and voltage.
- 5) Note the time taken for each 0.1V drop in indicated voltage.
- 6) When the E.S.V. automatically cuts off at 4.4V, disconnect the E.S.V. (upon cut-off, the meter will rise to about 4.7 to 4.8V and the L.E.D. will extinguish).
- 7) Using the graph, plot your curve. (Example in Figure 1.)

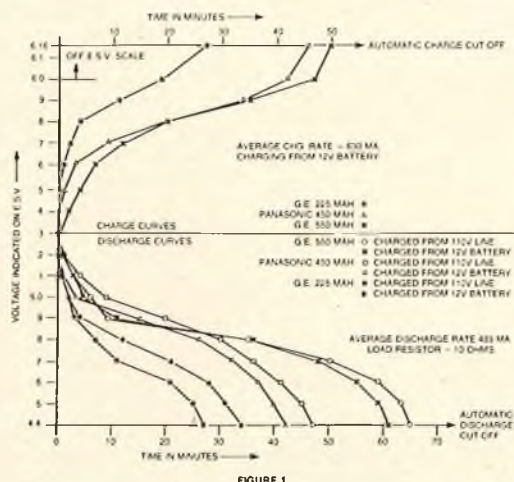


FIGURE 1

- 8) Divide the average discharge current by the time in hours taken to reach 4.4V. This will give you the capacity of your battery in MAH.

Perhaps you have wondered about the miniature jack on the back of the E.S.V. This is included for connection to a future project — namely a digital readout timer that will display the battery capacity in milliampere-hours automatically and unattended. Although it does not take the place of the curve, it will enable you to check your flight pack periodically, thus detecting any degradation of capacity. CAUTION — all capacity testing should be done at room temperatures. If you have come from the field on a blistering hot or freezing cold day, allow time for the battery to stabilize to 70° to 80°F before attempting test. This brings us to the next topic.

#### Effects Of Temperature

Ni-cad batteries are affected by temperature and this must be taken into account. As is shown in Figure 2, the charging voltage may vary between 6.4V and less than 6V with temperature at a nominal charge rate of 1C.

I have charged a 550 MAH pack in the oven at 140°F and the voltage never exceeded 6V during charge. (The charging current raises battery voltage by about 0.5V.) This means that the charger would never

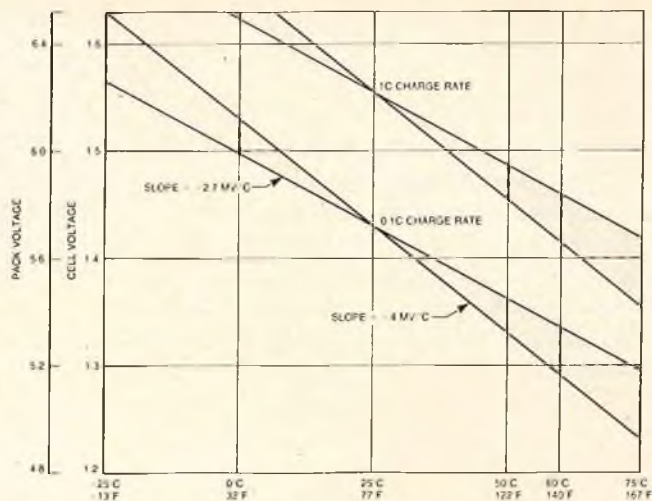


FIGURE 2  
REPRESENTATIVE CHARGE VOLTAGE V.S. CHARGE TEMPERATURE — SEALED CELL  
(CELL VOLTAGE WHILE UNDER CHARGE AT 0.1C AND 1C)

reach its auto-cut-off voltage which would result in continued charging resulting in possible cell damage. If it is very hot at the field and during charge, and you observe that the meter stays steady at something around 6V for more than 5 minutes, immediately terminate charge by depressing the reset button to prevent cell damage. Obviously the cut-off voltage will lower somewhat and although elevated temperatures affect capacity, it is not linearly related to the voltage. Caution is thereby advised on hot days, especially if your model is dark colored and has been sitting out in the sun for extended periods of time — the temperature inside may easily approach 140°F.

The reverse is true in cold environments. Since the battery voltage is higher, cut-off will be reached sooner thereby not charging the battery as much as would be indicated. This means you should recharge more often when it is cold out.

#### Summary

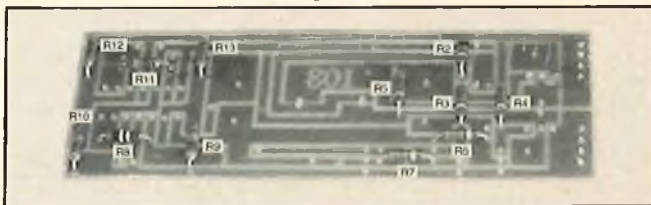
First, I would like to thank Mr. Red Schofield of G.E. without whose sage advice this article would never have been possible. Red knows Ni-Cad batteries front and back and the charges for the time spent on the phone with him amounts to about what I will make from this article!

I have found that the E.S.V. presented herein to be an extremely useful tool both at the flying field and in the shop. I believe it will pay for itself in saved models. Above all, since there is no calibration necessary to produce the required accuracy, you may rely upon what you see on the meter.

A similar project for Tx batteries is forthcoming along with the promised automatic battery condition digital readout instrument.

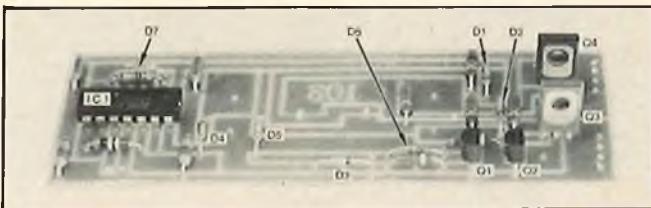
So, without hesitation let's start - - -

#### Building the E.S.V.



#### Step 1.

Consulting the overlay, install all resistors. Solder.

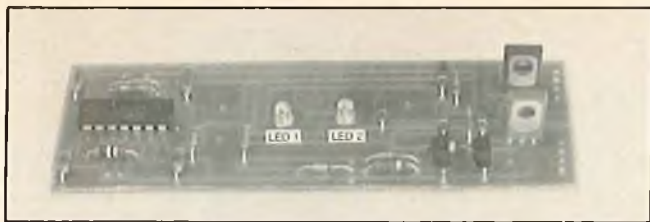


#### Step 2.

Install all diodes, transistors and the I.C. solder.

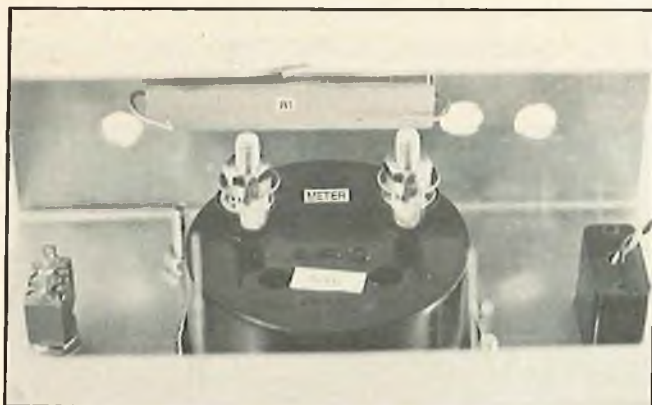
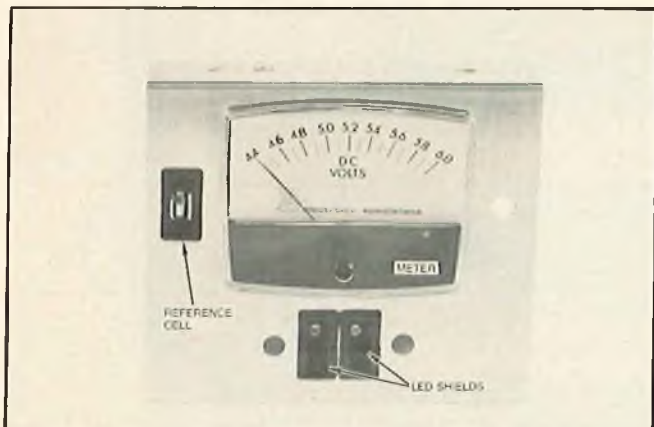
A complete kit of parts may be obtained by sending \$36.95 plus \$1.50 postage and handling (postal money orders or bank drafts save time) to: (new address) D & D Electronic Specialists, Box 2102, Lake Havasu City, Arizona 86403.





### Step 3.

Install L.E.D. 1 and 2 being careful to put the longer lead where indicated. Make sure that the LED's are seated firmly on the board and don't stick up on their leads. Solder.



### Step 4.

Bolt meter into place, install L.E.D. shields and reference battery (long brass tab to left) using Zap or epoxy. Install 10Ω 10W (R1) resistor on rear panel of chassis as shown — again using Zap or epoxy. Install grommets and jack on back panel. (See Step 9 for proper orientation of jack.)

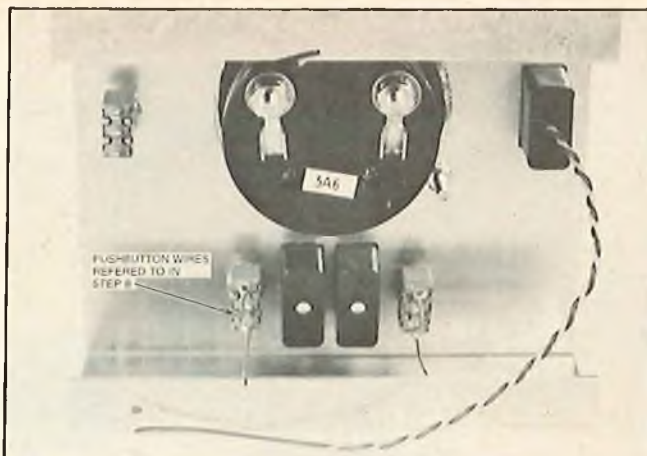


### Step 5.

Cut off center lug of all three push buttons. Using scrap wire from resistors, form and solder leads onto two of the push buttons as shown.

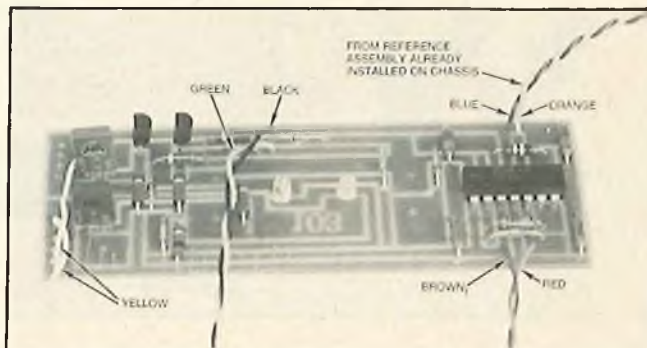
Dealer inquiries are invited. For complete servicing, contact: Chuck Moses R/C Electronics, 2817 E. Lincoln, Anaheim, California 92806. (714) 630-5061.

Due to past errors concerning addresses (Bowery Boys strike again), here are the correct addresses for: Dunham's R & R, 1100 Lake Havasu Avenue, Suite I, Lake Havasu, Arizona 86403. Mathes Electronic Systems, 1229 Lake Havasu Ct., Box 132, Lake Havasu, Arizona 86403.



### Step 6.

Install all push buttons as shown. There is no polarity so they may be installed either direction. Just make sure that the top nut is flush with the push button bushing.

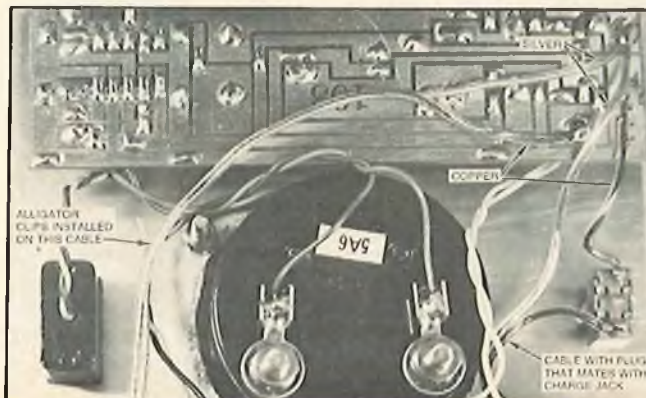
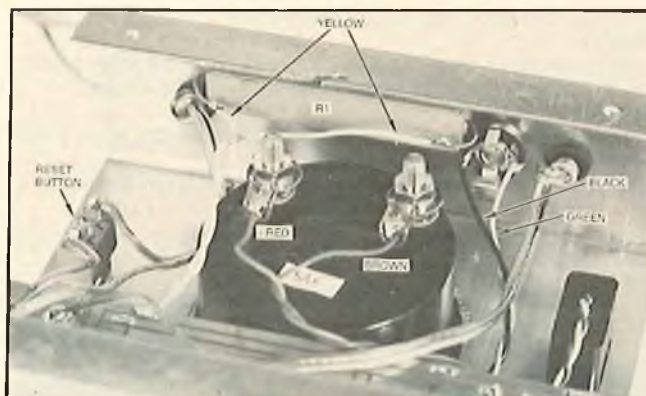


### Step 7.

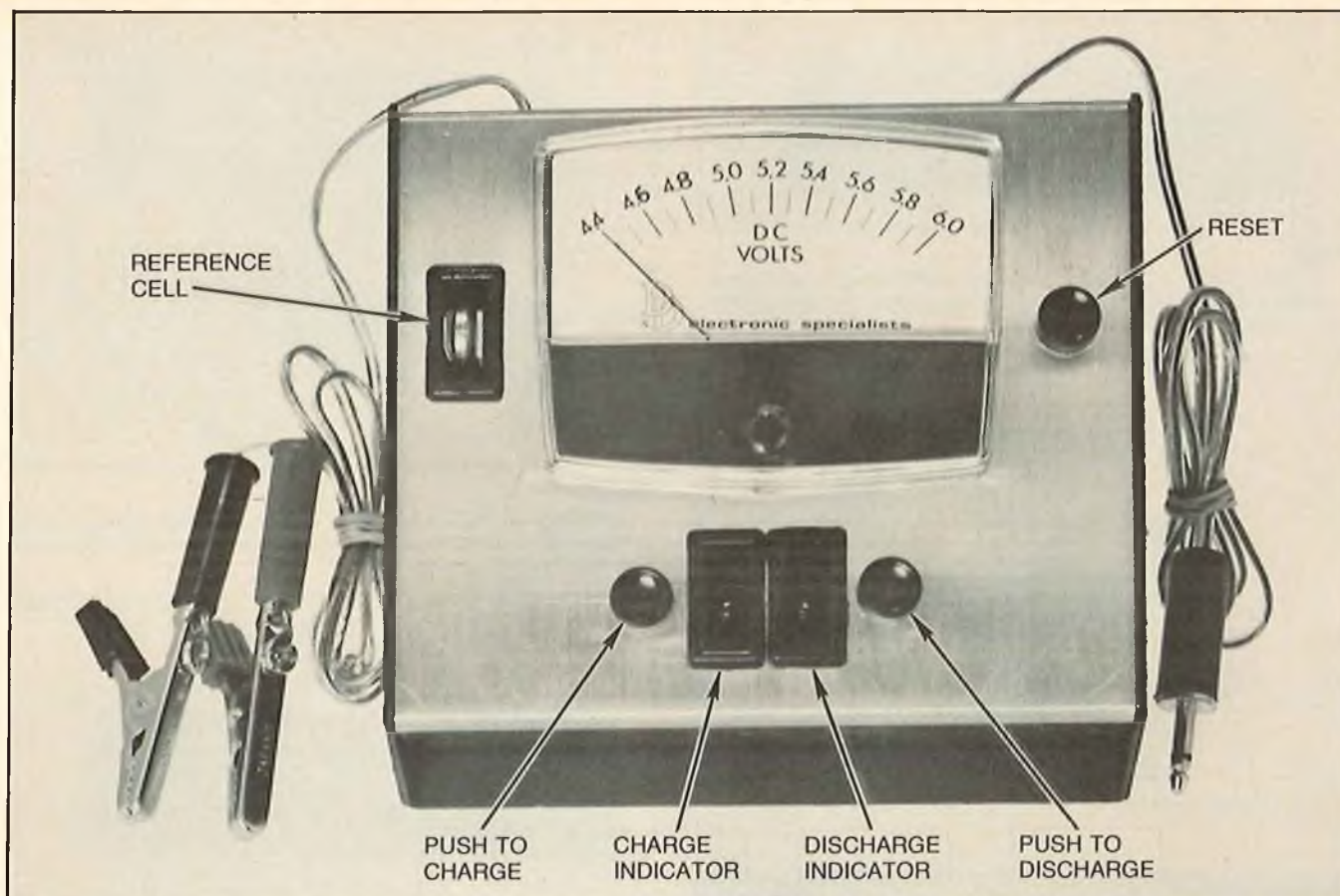
Install all wires on P.C. board as shown. Solder.

### Step 8.

Run push button wires (see photo for Step 6) through their respective holes and push board up into place until L.E.D.'s nest in their respective shields. Solder.







#### Step 9.

Solder wires to meter (be sure red wire goes to + of meter), jack and 10 $\Omega$  resistor as shown. Run clear plastic speaker wires through grommets as shown. Note how the right hand copper part of the lead that plugs into the charge jack is connected to the reset button. Solder these leads to the foil side of the board as shown.

#### Step 10.

Install alligator clips on ends of 12V battery wires. The red clip goes on the copper wire, black on the tinned wire.

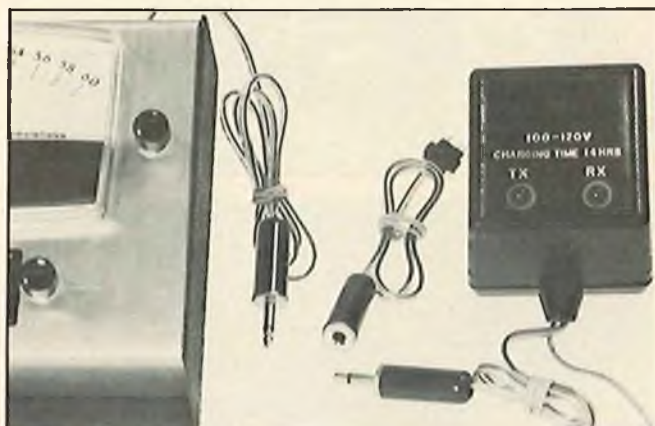
#### Step 11.

Install reference cell in its holder. The silver colored part of the cell is + and should contact the longer brass terminal of the holder.

#### Step 12.

Assemble case by bolting feet on bottom with the sheet metal screws supplied.

This completes the assembly of your D & D #103 Rx Battery Manager.



*If you have trouble obtaining the charge jack plug from your Mfg., do what I did, i.e., put a plug and jack in the Rx charge line and on the E.S.V. as shown. Use female plug on charge jack wire and male plugs on E.S.V. and wall charger. Make sure of your polarity; use meter if necessary to make sure copper wire is positive and silver wire is negative.*

#### PARTS LIST

##### Resistors:

- R1 (1) 10 $\Omega$  10% 10 watt wire wound.
- R2 (1) 100 $\Omega$  10% 1/4 watt, brown, black, brown, silver.
- R3 (1) 220 $\Omega$  10% 1/4 watt, red, red, brown, silver.
- R4 (1) 220  $\Omega$  10% 1/4 watt, red, red, brown, silver.
- R5 (1) 2.2K 10% 1/4 watt, red, red, red, silver.
- R6 (1) 2.2K 10% 1/4 watt, red, red, red, silver.
- R7 (1) 2.2K 10% 1/4 watt, red, red, red, silver.
- R8 (1) 100K 10% 1/4 watt, brown, black, yellow, silver.
- R9 (1) 10K 1% RN55 1/8W, Value written on resistor.
- R10 (1) 10K 1% RN55 1/8W, Value written on resistor.
- R11 (1) 10K 1% RN55 1/8W, Value written on resistor.
- R12 (1) 22.6K 1% RN55 1/8W, Value written on resistor.
- R13 (1) 35.7K 1% RN55 1/8W, Value written on resistor.

##### Semiconductors:

- I.C.1 (1) LM324N
- Q<sub>1</sub> (1) 2N3646
- Q<sub>2</sub> (1) 2N3646
- Q<sub>3</sub> (1) 2N5191
- Q<sub>4</sub> (1) 2N5194
- LED 1 (1) Clear plastic — red L.E.D.
- LED 2 (1) Clear plastic — red L.E.D.
- D1-7 (7) 1N4148 Diode

##### Wire:

- 4" Brown
- 4" Red
- 8" Yellow
- 4" Black
- 4" Green
- 36" Two conductor speaker wire

##### Reference Cell:

- Union Carbide (EverReady) #343

##### Alligator Clips:

- Radio Shack #270-347

##### Push Buttons:

- PB1-3 (3) — C & K #8121

##### (4) Rubber Feet

- (4) #4 x 1/2 sheet metal screws.
- (1) sheet metal box.

##### Meter:

- 0-50 $\mu$ A — Radio Shack #22-051

##### Miscellaneous:

- (2) Mathes L.E.D. shields.
- (1) Reference cell holder.
- (1) Miniature phone jack — Radio Shack #274-323.
- (1) Printed Circuit Board D & D #103
- (2) 1/4 inch grommets

##### Charge Jack

- Radio Shack #274-283





# QUICKIE 100

BY  
RON SHEAN

● Half-A Pylon Racing is getting up into the 90 mph range with a new breed of planes which fly very well but are a pain to build, service, and repair. With a few minor modifications, hot fuel, and a good engine even the Quickie 200 is smoking around the pylons with the latest racers.

It's time to slow things down again, so how about a new plane and a new class of pylon racing for the winter? Yes, I said *winter*! The new Quickie 100 is for *in-door* pylon racing.

The Quickie 100 is designed around the new Cannon Super Mini 2-channel receiver with the 100 mah fast charge nicad battery. The airborne unit weighs 3.2 ounces and the plane, ready to buzz the pylons, weighs only nine ounces.

In the East and the Midwest, where the weather gets fierce in November, the R/C gear goes into hibernation until April. No flying for six months! Incredible! The winter flying blues can be beaten by locating a large heated building, getting the racing nuts together and holding Quickie 100 races one Sunday a month

all winter. It sounds a bit far out, but, two or more clubs could get together to secure an acceptable large building for racing, possibly an airplane hangar, a warehouse, or even a skating rink. The racing meet might involve traveling quite a distance for some but could be enjoyed as a winter "indoor picnic" for the whole family. Winter racing will keep the flying reflexes sharp all year. The energy produced by these little racers in flight is quite low and poses little danger to spectators or property. Of course the Quickie 100 is an outdoor plane, too, and, due to the low noise factor, can be flown almost anywhere.

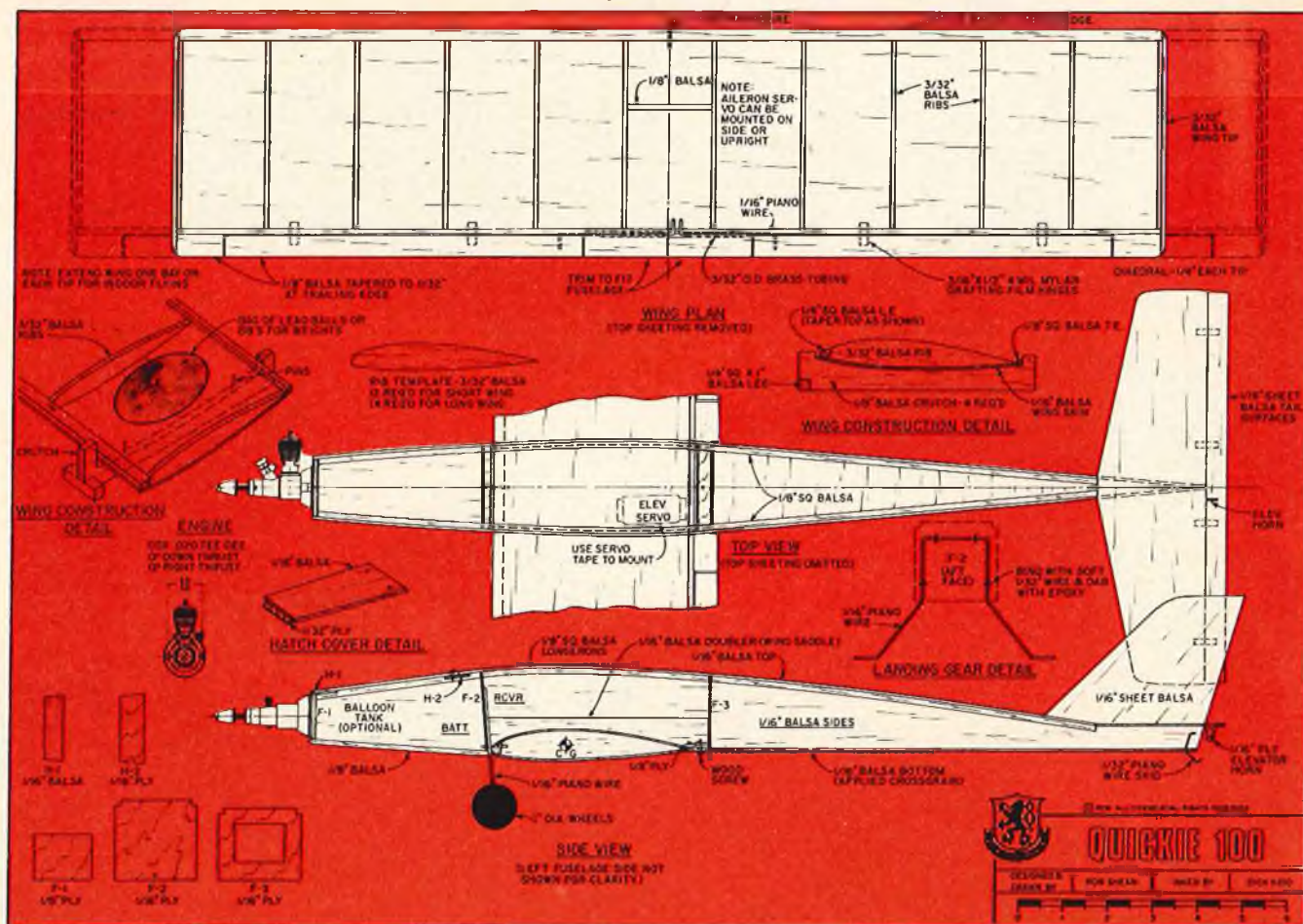
## CONSTRUCTION

**Fuselage:** Cut the fuselage sides, top, and tail from light, but firm 1/16" sheet balsa. Cut out the plywood formers and other plywood and balsa parts. Bind the 1/16" piano wire landing gear to former F-2 with soft 1/32" wire and dab a little epoxy on each binding. Using a ball point pen, mark the center line on the fuselage top, formers, and mark the

former stations on the fuselage sides. This assures an accurate and easy job.

Begin assembly by gluing 1/8" square balsa strips to the fuselage sides with "Hot Stuff", Zap, or one of the Alpha Cyanoacrylate adhesives. For a quick and positive bond with the Hot Stuff, always smear a light coat of white micro balloons between the mating surfaces. Attach formers F-2 and F-3 to the fuselage top, making certain that the angle between the top and each former is correct. Add the sides and, with epoxy, add the firewall F-1, the wing saddles, plywood wing hold-down, tail, and wire tail skid. Epoxy the 1/16" bottom sheet balsa on crossgrain, add the 1/8" sheet bottom front, H-1, H-2, and construct and fit the hatch cover. Cut the elevator horn from scrap 1/16" plywood, drill the pushrod holes and epoxy to the elevator. A light application of Hot Stuff to the pushrod holes in the horn toughens them against wear. Seal the tank compartment with K & B Superpoxy, sand the fuselage and tail, and apply 2 coats





of Superpoxy, sanding lightly between coats.

Hinge the elevator using nylon thread hinges, or the usual slot-and-hinge method using 1/8" x 1/2" hinges cut from scraps of 4 mil mylar drafting film. Rough up the hinges with pin holes, slide into the slots, and secure with a liberal application of Hot Stuff. Solarfilm, or similar iron-on covering, gives an attractive, durable finish. Seal the edges with a thin coat of clear Superpoxy to prevent peeling, caused by high nitro fuels. This is a good chance to use up those odd scraps of covering left over from the big birds.

The elevator pushrod is made from a length of 1/32" wire with "Z" bends in each end and an additional "Z" bend in the servo end of the wire for trim adjustment. An elevator throw of 3/16" up and down is about right.

**Wing:** Cut the 12 wing ribs from 3/32" balsa sheet and select a straight 1/4" square x 22" long balsa leading edge, a piece of 1/8 square balsa 20" long, and two sheets of light but firm balsa 1/16" x 4 1/2" x 22" long for the wing skin. Join the two sheets together with Hot Stuff to obtain the 4 1/2" width. Cut the four wing building supports from scraps of 1/8" balsa sheet. Bevel the 1/4" square balsa leading edge as shown on plans and epoxy it to the bottom wing skin. Assemble the wing supports on a

flat surface — a glass top coffee table is perfect, if you dare — and pin the bottom wing skin to the supports. Add weights to keep the supports flat on your building surface. Using Hot Stuff and micro balloons, attach the ribs, mylar aileron hinges, and 1/8" square balsa trailing edge to the bottom wing skin. Add the 1/8" balsa center spar and, using 15 minute epoxy, put on the top wing skin. When well set-up, remove from the supports and add the tips, trailing edge, and strip ailerons. Sand and paint on two coats of K & B Superpoxy. Drill and epoxy the wing mounting dowel in place. A short piece of 1/16" piano wire can be used instead of the 1/8" dowel. Cut out the servo well and box in the sides with 1/16" balsa scrap and smear epoxy over the surfaces. Install the servo on its side with 1/8" servo tape. The aileron pushrods are two pieces of straightened paper clip wire with "Z" bends in each end. For trim adjustments, simply bend the wire with a pair of pliers. The correct throws for the ailerons are 1/16" up and down. After the trim flights, however, adjust for the movement you prefer.

Solarfilm type covering may be used on the wing as well as the fuselage. If so, cover the ailerons before attaching them to the wing. Large lightening holes may be cut from the top and bottom wing to achieve a slight weight reduction. Balance, fit and attach wing to the fuselage

with a wood screw, or blind nut and machine screw.

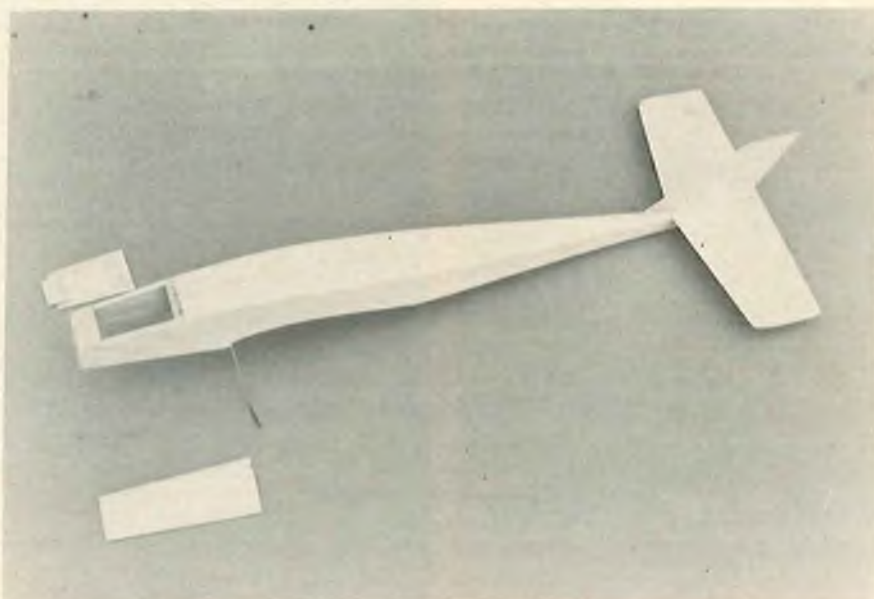
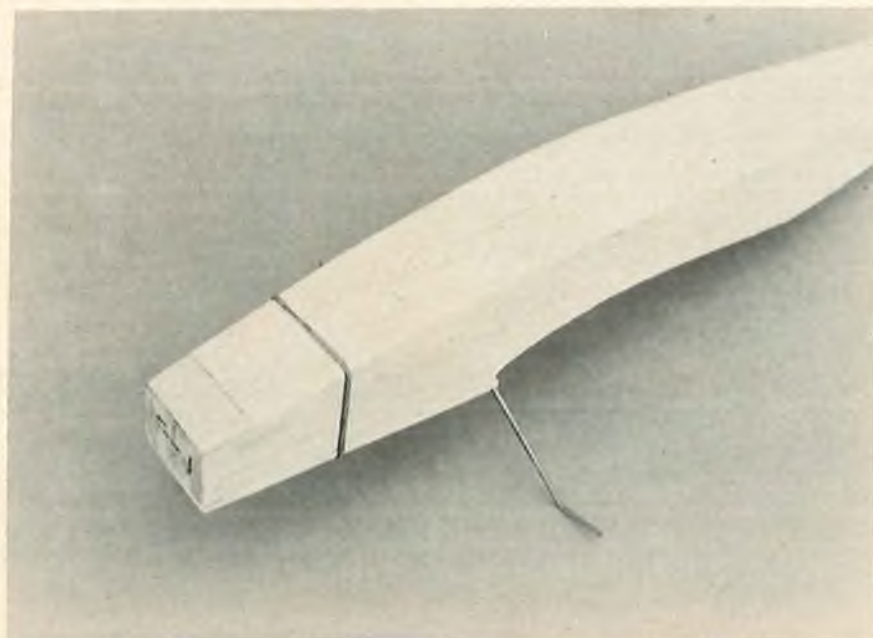
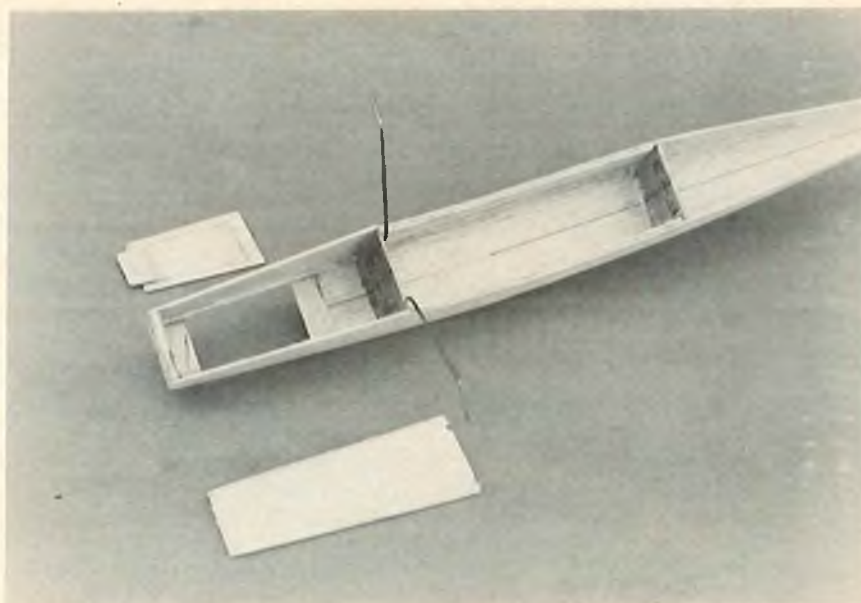
**Flying:** Set the C.G. as shown on the plans and, with the radio turned on, test glide into a tall grass area. Adjust the controls for a straight ahead glide, gas up with 30% nitro fuel (Cox Racing Fuel), and get the engine running fast and steady when the nose of the plane is pointed up. A gentle launch from an easy run and you're airborne. The ailerons are quite effective so be wary at low altitudes. Trim out and get the feel of the plane until the engine quits. Land, adjust the trims, refuel, start the TD, and head for the pylons.

**Engine:** The Cox TD .020 engine is a miniature of the powerful TD .049 and is a surprisingly easy starting little powerhouse if properly fueled and maintained. Keep the engine, and the fuel free of dirt. The length of run, on the tank mount supply, is from 2 to 3 minutes. Connect a U-shaped piece of fuel line to both tank filler tubes to prevent in-flight fuel loss. A balloon tank will provide a longer flight time and the constant fuel pressure really needed for a steady engine run at all flight attitudes. Cox Racing fuel, or any fuel with a minimum of 30% nitro, is the recommended fuel to use. It gives lively performance and is easy on glow plugs. Use fuels with synthetic oils only to avoid the varnish build-up caused by castor oil lubricants. The best



propellers are the Cox black plastic 4/2.5P or the 4.5/2.5P. Avoid the gray ones, they break too easily.

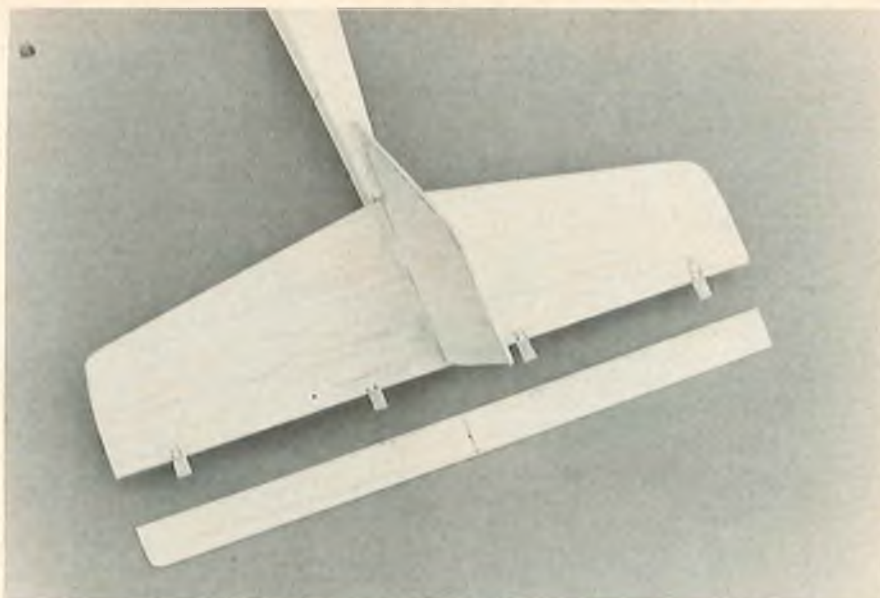
One vital accessory which is mandatory with all Cox engines is the piston rod ball joint reset tool. Inside of one hour's running time the rod can loosen to the point where the engine will barely run if, in fact, it will even start. To check for this condition, remove the cylinder barrel, turn the crank to top dead center and, while holding the crank firmly, grasp the piston with two fingers and work it up and down. If a clicking or any excess looseness is felt, remove the piston-rod unit and tighten with the reset tool. The power and ease of starting will return dramatically. It's a great little engine. Cox does not sell the reset tool, for some reason, but it can be obtained at some hobby shops or can be purchased for \$2.95 plus tax from Kustom Kraftsmanship, Box 2699, Laguna Hills, California 92653.



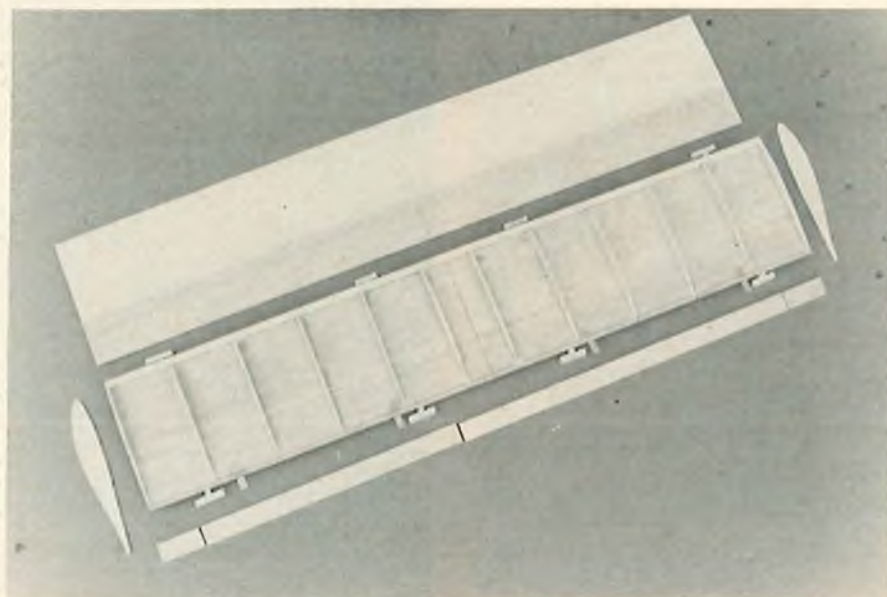
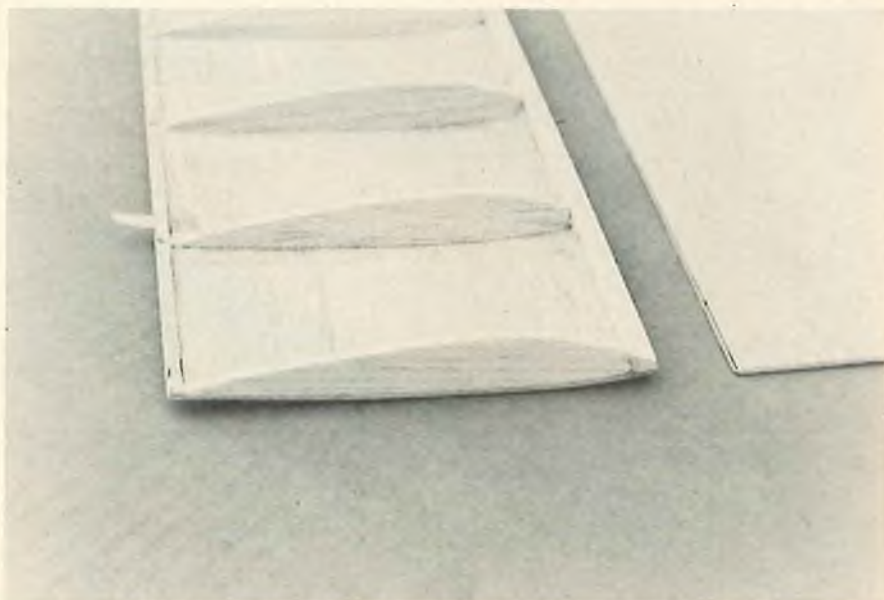
**TYPE AIRCRAFT**  
1/4A Pylon  
**WINGSPAN**  
22.2 Inches Std.  
(26.7" — Indoor Wing)  
**WING CHORD**  
5.02 Inches  
**TOTAL WING AREA**  
112 Sq. Inches Std.  
(134 Sq. Ins. — Indoor Wing)  
**WING LOCATION**  
Low Wing  
**AIRFOIL**  
Semi-Symmetrical  
**WING PLANFORM**  
Constant Chord  
**DIHEDRAL, Each Tip**  
1/4 Inch  
**O.A. FUSELAGE LENGTH**  
20.5 Inches  
**RADIO COMPARTMENT AREA**  
Not Given  
**STABILIZER SPAN**  
8.7 Inches  
**STABILIZER CHORD (Incl. Elev.)**  
2.5" Average  
**STABILIZER AREA**  
21.75 Square Inches  
**STAB AIRFOIL SECTION**  
Flat  
**STABILIZER LOCATION**  
Top of Fuselage  
**VERTICAL FIN HEIGHT**  
2.83 Inches  
**VERTICAL FIN WIDTH**  
2.7" Average  
**REC. ENGINE SIZE**  
Cox TD 0.020  
**FUEL TANK SIZE**  
1/2 Ounce  
**LANDING GEAR**  
Conventional  
**REC. NO. OF CHANNELS**  
Two  
**CONTROL FUNCTIONS**  
Elevator and Ailerons

**BASIC MATERIALS USED IN CONSTRUCTION**  
Fuselage ..... Balsa and Ply  
Wing ..... Balsa  
Empennage ..... Balsa and Ply  
Weight Ready-To-Fly ..... 7 — 10 Oz.  
Wing Loading ..... 9 — 13 Oz./Sq. Ft.





*If you want a quickly built racer for indoor and outdoor events, try the Quickie 100. Designed for two channel mini-sets, and a Cox .020 engine, these small pylon ships can open up an entire new era of club sport racing at a minimum of cost.*



#### **Objective**

Same as Quickie 200 Rules

#### **General**

Same as Quickie 200 Rules

**Model Aircraft Requirements**

Same as Quickie 200 Rules

#### **Engine**

Same as Quickie 200 except for the 0.020 engine displacement

#### **Engine Claiming**

Not enough data available on engines

#### **Throttle**

None

#### **Muffler**

None

#### **Propellor**

Same as Quickie 200 Rules

#### **Weight**

Not less than 8 ounces or more than 12 ounces

#### **Fuel**

Same as Quickie 200 Rules

#### **Identification Markings**

Same as Quickie 200 Rules

#### **Workmanship, Operation of Quickie 100 Race, and Scoring**

Same as Quickie 200 Rules

These proposed rules are for outdoor racing only. For indoor racing many additional rules might be necessary in the interest of safety:

1. All racers flown, tested, and trimmed prior to race.

2. Emergency engine shut-off may be necessary.

3. Each heat may be run in two, two-plane races with the winners determined by elapsed times.

4. A two pylon course might be used for spectator safety and no callers would be allowed. □



# HALF-A STAND-OFF SCALE

## INTRODUCTION

The need for 1/2A Stand-Off Scale rules has come about from the fantastic growth of 1/2A activity all over the country. We are seeing more and more realistic small models at the flying fields simply because they fly well, are economical and esthetically attractive.

Field requirements are much less for the smaller airplanes and, with no scoring of take-off and landing, paved areas are not required. Because of the relatively low cost of new two channel radios, a kit, engine and radio can be purchased for less than \$100.00. This means that younger modelers can participate with considerably less cost and effort. No matter what the size of airplanes being flown, some of us will be flying Scale type machines, so it is only natural that 1/2A Stand-Off Scale rules be included with the other Scale categories.

1. **General.** All pertinent FCC and AMA regulations shall be applicable.
2. **Safety Requirements.** Considerations of safety for spectators, contestants and officials are of the utmost importance in this event. The following safety provisions must be observed.
  - 2.1 All models must pass a general safety inspection by the event director or his representative before flying.
  - 2.2 Any flying over a controlled spectator area will be cause for

immediate disqualification of that flight.

- 2.3 Dangerous flying of any sort, or poor sportsmanship of any kind shall be grounds for disqualification of the contestant involved.
- 2.4 All planes entered must have rounded prop spinners or some sort of safety cover on the end of the propeller shaft (such as a rounded acorn nut).
3. **Builder-Flyers.** The builder and flyer of a 1/2A sport scale model shall be one and the same person. There shall be no team entries.
4. **Model requirements.** Any model resembling a particular heavier-than-air, man-carrying aircraft type is eligible to compete.
5. **Engine requirements.** The maximum single engine displacement is .06 cubic inches. There is no limit to the number of engines used, however, they may not exceed the total number of engines used on the full scale aircraft. Electric motors corresponding in power to .06 or less combustion engines may also be used. Mufflers optional but may be required to meet field requirements. All aircraft will have some type of positive fuel shut-off such as fixed pick-up or mouse trap that will stop the engine on command.
6. **Proof of Scale.** To prove that the model resembles a particular prototype, some proof of scale material is required.

- 6.1 Proof of Scale is the responsibility of the contestant.

- 6.2 To be eligible for Accuracy of Outline points, one of the following must be provided by the contestant:

**Either:** a. A 3-view drawing (line, tone or color).

**Or:** b. A selection of photos of the aircraft modeled, sufficient to show the outlines of the aircraft in side view, front view and plan view. Both of these items can be provided by the contestant if he so desires, but he is not required to furnish both, and no down grading of the Accuracy of Outline Score will be done by the judges if only one of the above listed items is provided and not the other.

- 6.3 To be eligible for Finish, Color and Markings points, some proof of the color scheme used on the model is required. This can be:
  - a. A photo or photos.
  - b. Some other pictorial representation, such as a magazine or other published color painting or drawing.
  - c. A detailed written description of the color scheme and/or markings from a reliable source.
  - d. Notes and diagrams of markings on a black and white 3-view. ("Profile" and similar types of color paintings in 3-view form

*All of the photographs presented with this article are of Half-A Stand-Off Scale models. The rapidly growing popularity of .049 sport scale necessitated the formulation of these rules.*







can be used for both proof of Accuracy of Outline and Finish, Color and Markings.)

- 6.4 If no proof of Accuracy of Outlines accompanies the model, no points can be awarded for Accuracy Outline. If no proof of Finish, Color and Markings accompany the model, no points can be awarded for Finish, Color and Markings. Points for Craftsmanship and Flight may still be awarded, even if one or both of the requirements for proof of Accuracy of Outline and Finish, Color and Markings are not complied with.

- 6.5 To facilitate rapid judging, Sport Scale documentary presentations are limited to no more than 6 pages (one side) sized 8½" x 11" or an equivalent area of some other arrangement.

All static judging will be done prior to flying.

#### 7. Static Judging.

- 7.1 Static judging shall be done at a distance of 10 feet from the model. It is recommended that a 20' diameter circle be laid out and roped off. The model is then placed in the center of the circle by the contestant or by a contest official other than the judges. The judges may circle the model during judging with the rope as a guide.

- 7.2 The judges will not pick up or examine the models closely before or during the judging. This rule is not intended to prevent display of the entries before or after judging for the benefit of spectators. The models may be displayed on the contest flight line, in a scale cage or whatever other area the Contest Director wishes to designate.

- 7.3 Details not deemed visible in flight (dummy engines hidden in cowlings, cockpit interiors, fine 3-dimensional surface details such as rivets, panel lines, etc.) but not including struts and/or brace wires, are not to be considered in scoring the model.

- 7.4 Subjects having uncowed radial engines, or configurations whose shape does not provide sufficient space such as the Spitfire, P-63, etc. or nose or cowlings sizes dictated by the scale to which the model has been built, which do not lend themselves to any practical method of completely concealing a standard type model engine, will not be downgraded in scale judging, when, of necessity, part of the engine must be exposed or non-scale openings are made for engine cooling or for installation of a muffler.



7.5 No changes shall be made between judging and flying which alter the scale appearance of the model except as noted below.

a. A flying propeller of any diameter may be substituted for a scale propeller for flight.

b. The propeller spinner used in flying must be the same size, shape and color as the one presented for scale judging except that it may have a different number of cutouts appropriate for the flying prop.

c. A radio antenna of any type may be added.

d. Models of seaplanes or flying boats are permitted to use non-scale devices or dollies for take-off in the absence of suitable water conditions. If dollies are used, they must not be attached to the model in flight. Deviations from scale through the inclusion of permanently mounted, recessed wheels, skids, plug-in removable landing gear or similar devices, if neatly and inconspicuously executed will not be penalized in the scoring of Accuracy of Outline points.

Models with increased dihedral or slightly enlarged tail surfaces shall not be down graded. Models with significant outline changes will be proportionately down graded.

8. **Static Scoring.** 100 points maximum may be earned as follows:

Accuracy of Outline (Gen. Impression) Max. 40 pts.

Craftsmanship Max. 30 pts.

Fin., Col., Markings Max. 30 pts.

9. **Event classifications.** No contestant shall have more than one entry in each classification.

9.1 Class I. Maximum of two control functions not including fuel shut-off. There will be no scale operation options in the flight pattern in Class I. Flight options will be from the list of ten flight maneuvers only.

9.2 Class II. In Class II there is no limit to the number of control functions. In addition to the ten flight maneuvers, the contestant may also add the following scale operations up to the five optional maneuvers.

1. Multi engines — maximum 10 pts.

2. Retractable landing gear — max. 10 pts. Wheels must retract immediately after take-off and prior to landing. Gear must retract in a scale-like manner for maximum points.

3. Bomb or parachute drop at a designated (maximum 10 pts.) target must be carried and dropped in the same manner as the prototype.

4. Crop dusting or spraying



(Max. 10 pts.)

#### 10. Flight

10.1 There is no limit to the number of rounds flown during the time scheduled for this event but at least three should be scheduled. Scoring will be based on the average of the best two flights.

10.2 Time limit for each flight is 10 minutes inclusive of starting engine(s). Engines(s) should be shut off on completion of flight maneuvers and the aircraft landed as quickly as possible.

11. **Flight Plan.** The flight pattern begins as the aircraft approaches the area in front of the judges and the contestant calls out he is beginning his sequence of maneuvers.

11.1 The contestant must fly his entire sequence of maneuvers according to the flight sequence presented to the judges. The sequence of maneuvers will be 5 mandatory and 5 optional as

selected by the contestant from the list of maneuvers. Maneuvers performed out of order will be scored 0.

11.2 No fly-bys are allowed during the aerobatic sequence except for the two parts of straight flight as required. If a fly-by is performed then the next maneuver shall receive zero points. (i.e., each upwind and downwind leg will consist of a maneuver once the flight sequence is started.)

12. **Flight Maneuvers:** As described in AMA or FAI Pattern, RC Scale Rules or RC Sport Biplane Rules.

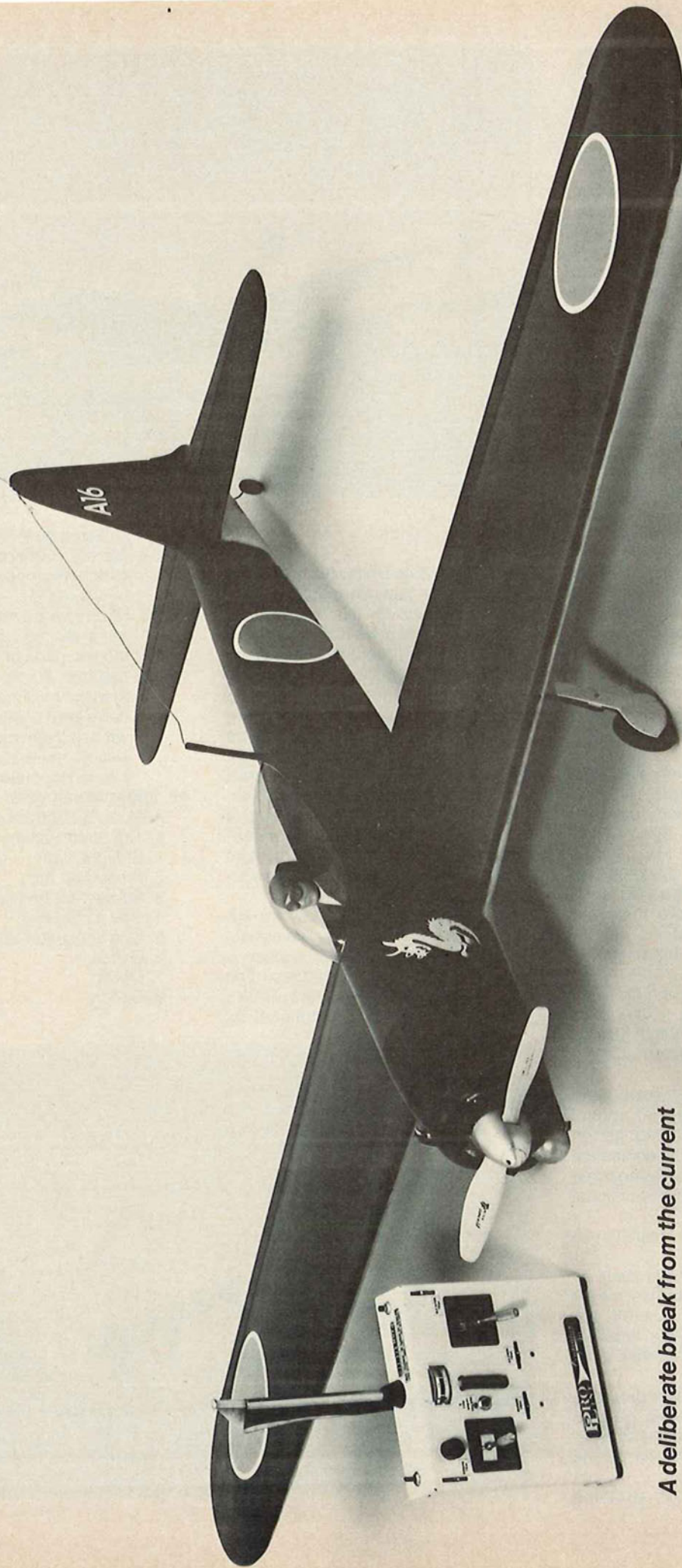
1. Straight flight — reduce to 200'
2. Procedure turn
3. Straight return flight
4. One inside loop
5. One horizontal roll (barrle or axial)
6. Option
7. Option
8. Option

to page 164





# SAMURAI



A deliberate break from the current trend of sleek, look-alike pattern ships, the Samurai is the result of stretching the famous Japanese Zero. The attention it will receive on the ground will be exceeded only by the admiration for its outstanding flight characteristics.

BY BOB WALLACE





**T**he current trend in pattern aircraft has been toward sleek looking designs that exhibit excellent flight characteristics. Unfortunately, most of these designs do not resemble any known full scale aircraft; on the other hand, most scale World War II vintage fighter designs do not lend themselves well to "Sunday Flier" type of use with regard to ideal flight qualities.

The Samurai was conceived and designed in an effort to combine the best of both of these worlds and result in a sport pattern aircraft that would fly with pattern ship smoothness, be easy for the average Sunday flier to build and fly, and resemble a World War II fighter.

The Samurai was the result of stretching the famous Japanese Zero design (admittedly to the limit) to incorporate desirable flight producing dimensions. While the Samurai is certainly not even Stand-Off Scale material — it still retains the basic shape and lines of the Japanese Zero.

The Samurai is guaranteed to attract more spectator attention at the flying field than the usual "all look-alike pattern ships" and the ugly box fuselage slab wing sport designs. The attention it garners on the ground will be retained when the Samurai becomes airborne as its flight performance is outstanding. It will easily perform every pattern maneuver; is as smooth and stable as a pattern ship, while not quite as fast; and lands like a trainer. It's been flown by experienced pattern pilots who confirm its flying qualities, but even more important, it has been easily flown by average sport type fliers with no difficulty.

If you're searching for a sport pattern aircraft with a World War II look, why not build a Samurai!

### CONSTRUCTION

**Fuselage:** Cut out the two 3/16" sheet balsa fuselage sides (if 48" long stock is available in your area — you can avoid making the splice). Save the scrap pieces cut out over the stabilizer/elevator area. Cut out the 1/4" sheet balsa fuselage doublers. Glue the doublers to the fuselage sides. Cut out the fuselage firewall and formers (F-1, F-2, F-3, F-4, and F-5) from 1/4" ply or sheet balsa as indicated. Glue the firewall (F-1), F-2 and F-3 in place. (If you own a fuselage building jig, use it.) Be sure all formers are properly aligned. Add formers F-4 and F-5 and bring the fuselage sides together at the tail and glue. Add 3/8" triangular stock around the firewall (F-1). Drill the engine mount holes in the firewall (F-1) and install the mount with

6-32 screws and blind nuts. Bevel the angular side sheets (top and bottom of the fuselage) and install. You may leave the other edge of these strips rough and, after they are glued in place, merely plane or sand them down flush with the top and bottom of the formers. Install the top and bottom fuselage sheeting. Plane and sand the fuselage to the indicated shape. Coat the fuel tank compartment with fiberglass resin or thinned epoxy. Install your engine (be sure to seal off the exhaust, carb opening, and fuel nipple). Cut the front nose ring out of 1/2" pine or hard balsa and shape it. Position the cowl nose ring according to the engine thrust washer and proceed to cowl in the engine with 1/2" sheet balsa blocks. Plane and sand the cowl (using the fuselage at F-1 and the nose ring as guides) to the proper shape. Cut the cowl opening around the engine to allow for engine removal. Cut out the cockpit opening and install the cockpit formers and floor. Install the hardwood wing mounting blocks. Set the fuselage aside for now.

**Tail Surfaces:** Construct the stabilizer and vertical fin directly over the plan using the indicated balsa sizes. Cover the stabilizer and vertical fin with 1/16" sheet balsa on the top and bottom. Sand to shape. Cut the elevators, elevator spacer block, and rudder from 3/8" sheet balsa. Sand to the proper shape. Cut all slots for the hinges and drill holes for the horn. Install the hinges and the horn in the stabilizer/elevator assembly. Notch the elevator spacer block to allow for the control horn movement and install. Do not assemble the vertical fin/rudder at this time. (Be sure to strive for a good close fit between all control surfaces.) The tail surfaces can now be glued in place on the fuselage, using the following sequence: mount the 1/16" ply







tail wheel plate with its brass tube bearing in place; silver solder the brass control arm to a piece of 1/16" music wire; insert the 1/16" wire in the brass bearing; and solder a washer to the wire on the bottom of the fuselage. Make the required bends to accept the tail wheel. Drill a hole in the elevator spacer block for the top of the rudder/tail wheel wire to go through. As the elevator pushrod connection is internal, the rod should be made and connected to the elevator horn now with a clevis and the stabilizer/elevator then glued in place. Use either 1/4" hard balsa or a 3/16" hardwood dowel for a pushrod. With the stabilizer/elevator now in place, the vertical fin is glued in position. Bend the rudder/tail wheel wire 90 degrees to accept the rudder and install the rudder. Use the scrap 3/16" pieces that were saved when the fuselage sides were cut out, to fill in on top of the stabilizer after trimming off to allow for the stabilizer/elevator thickness. Install the balsa blocks on both sides of the rudder. Sand to shape and, using a micro-balloon type filler, blend the vertical fin/rudder smoothly into the fuselage.

**Wing:** Cut out the required number of ribs leaving the alignment tabs in place. Cut out all half ribs and wing tips. (If you own a rod type of wing building jig cut the alignment tabs off the ribs — stack ribs for each wing concentrically, using the main spar notches as a guide, and drill your rod holes.) Glue the ply half ribs W-4A and W-5A to their respective ribs (2 left, 2 right). Pin the lower spruce spar to the plan. Pin the ribs in place using the alignment tabs. Angle rib W-1 to allow for the dihedral. Add the 1/4" balsa leading edge, 3/16" balsa trailing edge, 3/32" balsa shear webbing and the top spruce spar. Glue the structure together, making sure all ribs and spars are properly aligned. Add the 1/4" balsa wing tips. Remove the wing structure from your building board and trim off the alignment tabs. Install the landing gear mounting blocks (fixed or retract). Cover the wings with 1/16" sheet balsa, covering both sides simultaneously to avoid warpage. Glue the 1/16" sheeting out to rib W-10 only, but allow the sheet stock to extend over the tip. After the wing is

## SAMURAI

Designed By: Bob Wallace

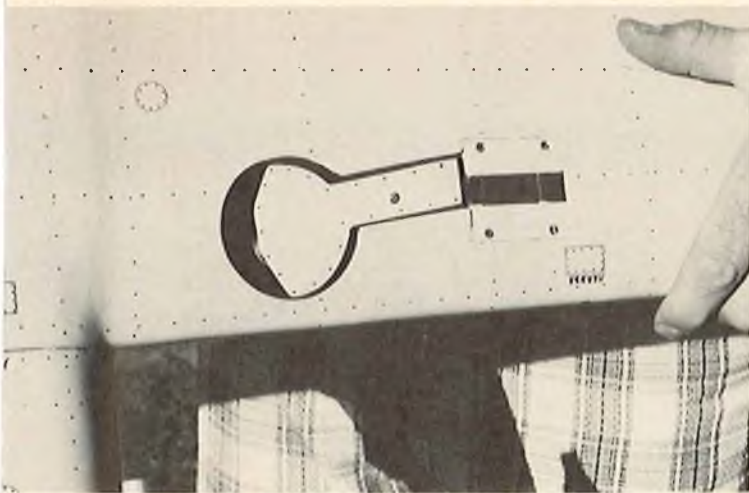
**TYPE AIRCRAFT**  
Sport Pattern  
**WINGSPAN**  
61 Inches  
**WING CHORD**  
9 1/4" (Avg.)  
**TOTAL WING AREA**  
560 Square Inches  
**WING LOCATION**  
Low Wing  
**AIRFOIL**  
Symmetrical  
**WING PLANFORM**  
Double Taper  
**DIHEDRAL, Each Tip**  
3/4 Inch  
**O.A. FUSELAGE LENGTH**  
43 1/2 Inches  
**RADIO COMPARTMENT AREA**  
(L) 10 3/4" X (W) 3" X (H) 2 1/2"  
**STABILIZER SPAN**  
22 Inches  
**STABILIZER CHORD (incl. elev.)**  
5 1/4" (Avg.)  
**STABILIZER AREA**  
113 1/2 Square Inches  
**STAB AIRFOIL SECTION**  
Flat  
**STABILIZER LOCATION**  
Near Top of Fuselage  
**VERTICAL FIN HEIGHT**  
6 1/2 Inches  
**VERTICAL FIN WIDTH (incl. rudder)**  
5" (Avg.)  
**REC. ENGINE SIZE**  
.40 Cubic Inch  
**FUEL TANK SIZE**  
8—10 Ounce  
**LANDING GEAR**  
Conventional  
**REC. NO. OF CHANNELS**  
Four - Five  
**CONTROL FUNCTIONS**  
Rudder, Elevator, Ailerons, Throttle  
Retracts (Optional)  
**BASIC MATERIALS USED IN CONSTRUCTION**  
Fuselage ..... Balsa and Ply  
Wing ..... Balsa, Ply and Spruce  
Empennage ..... Balsa  
Weight Ready-To-Fly ..... 82 Oz.  
Wing Loading (incl. stab) ... 17.5 Oz./Sq. Ft.

sheeted on both sides out to rib W-10, cut a small vee in the sheeting seam which extends over the tip block. This allows the sheeting to be glued to the compound curved tip with no buckling. Draw the tip sheeting down to the edge of the 1/4" tip from both sides simultaneously and glue. Block up the tips of both wing panels at rib W-10 to the proper dihedral angle and glue together. Install the ailerons and wing tip aileron stock. Notch out the wing center section aileron stock to accept the aileron horns and install. Sand the wing smooth to the indicated airfoil. Add the 1/2" wing hold-down bolt dowels. Cover the center section with 4" to 6" fiberglass tape and resin. Add the 1/4" leading edge wing dowels. If you are installing retracts, the openings and wheel wells should be cut now and the 1/64" ply walls installed. If fixed position landing gear is to be used, cut the slots for the 5/32" L.G. wire and hold-down straps. Cut the aileron servo (and retract servo, if used) openings and install the servo mounting beams. Position the wing to the fuselage and drill the holes with a #7 drill through the 1/2" dowels into the fuselage hold-down blocks. Tap the fuselage hold-down block holes with a 1/4-20 tap. Drill out the holes in the wing dowels to accept 1/4-20 nylon bolts. Bolt the wing in place with the 1/16" ply plate glued in place. Add the balsa blocks to the wing bottom and shape to the fuselage contour.

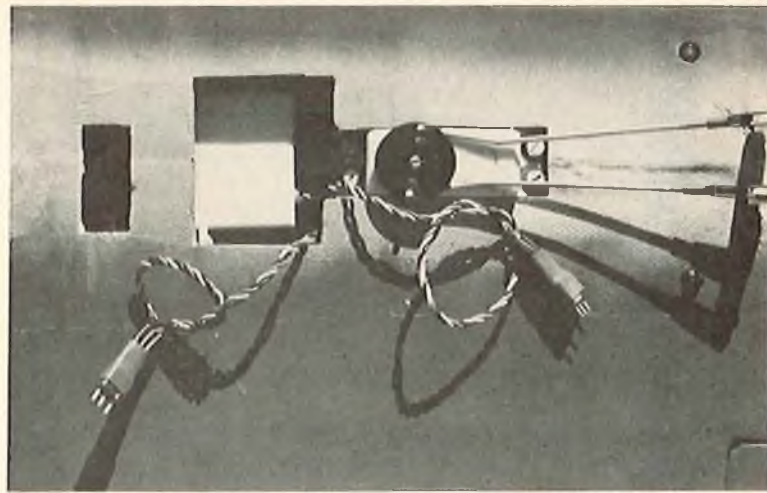
The cockpit details, pilot, head rest, canopy, and antenna mast should now be installed. The entire model should now be fine sanded in preparation for finishing.

**Finishing:** The method and type of finish is left up to you. I much prefer and suggest using 3/4 ounce fiberglass cloth and resin over the entire model. This adds considerably to its strength, seals the wood, and requires far less primer for finishing. I used the toilet tissue, excess resin removal method and it works super. If you are not familiar with this technique it is as follows: Cut the 3/4 ounce fiberglass cloth to size and lay on the surface to be covered. Apply the resin with a brush to the cloth. You don't have to be fussy here — just be sure the cloth is completely wetted with resin.

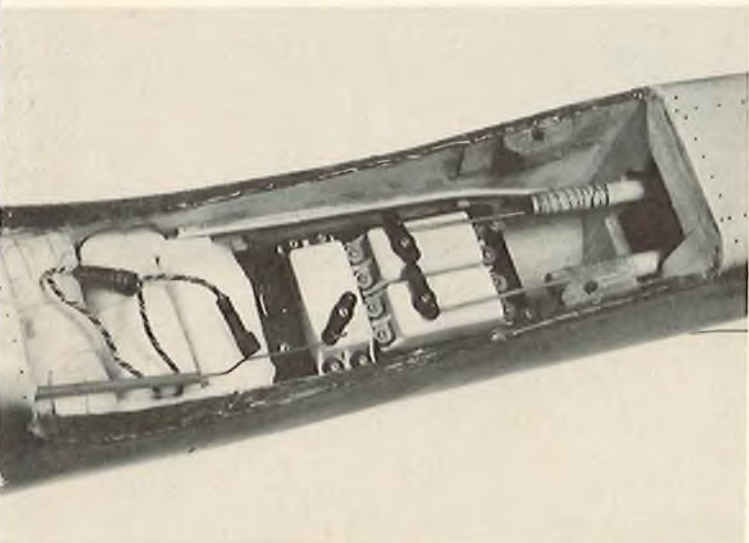




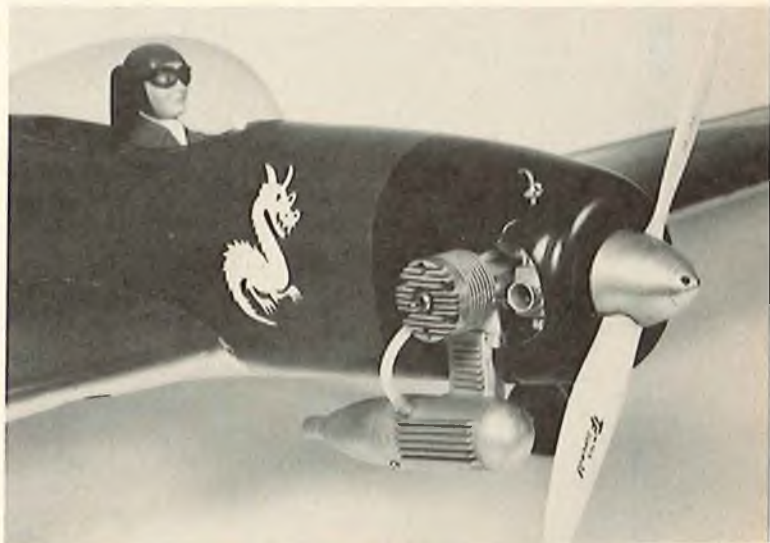
*View of one of the main gear in the retracted position. Retract gear is optional but certainly adds to flight realism. Rivet and panel detail done with a draftsman's pen and acetate based ink.*



*Detail of servo installation in the Samurai wing. Aileron servo shown at right, retract servo is buried in wing at center left. Pro Line radio used in author's prototype shown in these photos.*



*The Samurai radio compartment. White tube on the side is a soda straw used to route receiver antenna to the flexible mast. Battery pack is against a bulkhead, the receiver next, and then the PLS-15 servos on a Kraft tray.*



*View of side mounted O.S. Max .40 with muffler pressure. Top Flite 10/6 prop. "Dragon" design on fuselage sides made from wet sanded yellow trim MonoKote. Perfect Paint used over glass cloth & resin base.*

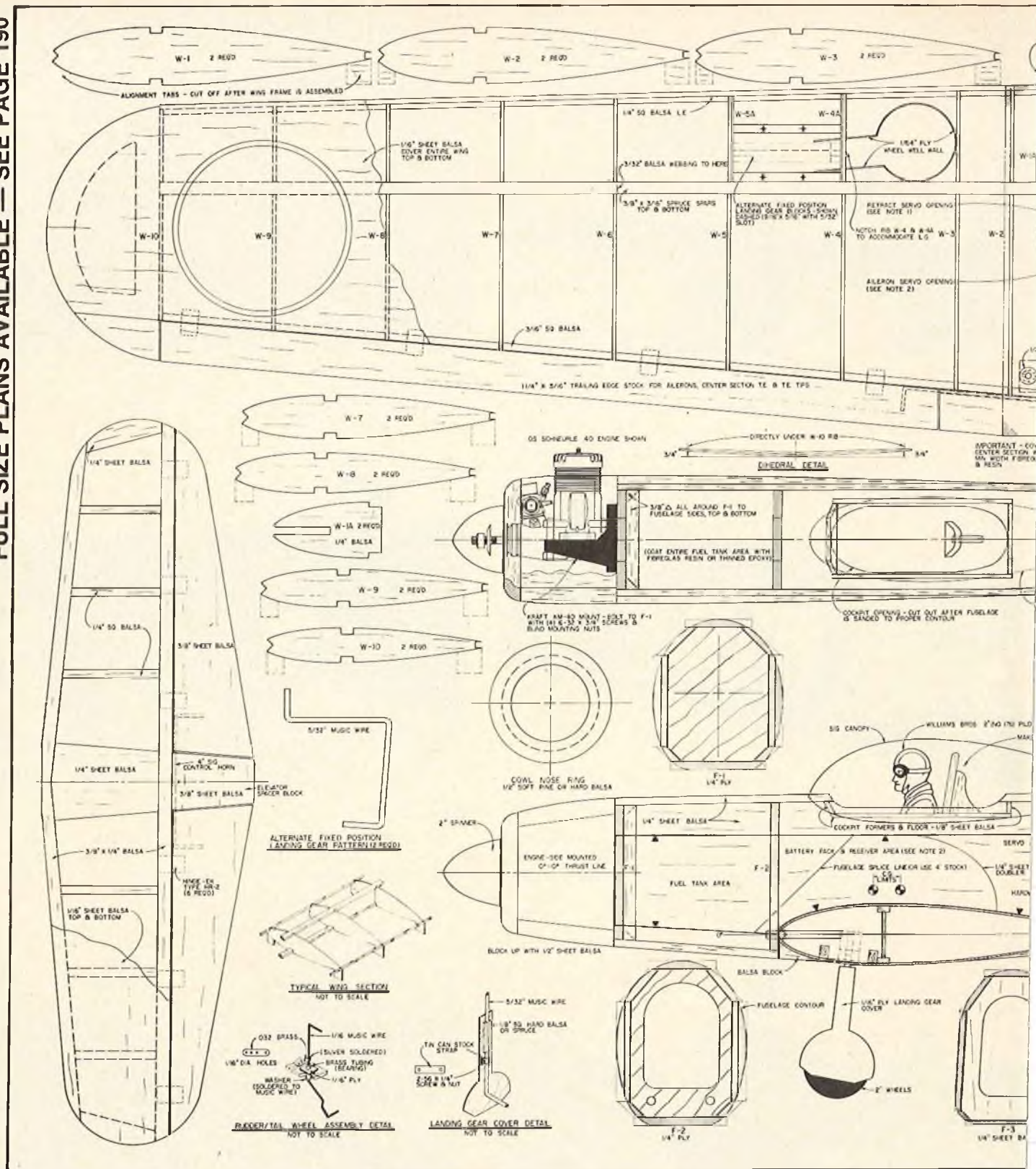


*The author with the Samurai after a day's flying at Central Connecticut RC Club Field in South Windsor, Conn. Radio antenna mast is completely flexible, allowing it to "give" in case you should flip over on a landing.*



*The Samurai takes to the air. Suck up the gear and you have a realistic looking pattern aircraft that the Sunday flyer will find easy to fly. In fact, the novice could use the Samurai as a low wing, full-house trainer.*





Gently smooth out all wrinkles and bubbles in the cloth. Now take a roll of toilet tissue, lay it on the prepared surface, and unroll a length over the cloth and resin. Tear off from the roll and gently blot the excess resin with the tissue and throw it away. Continue this process until the tissue no longer absorbs any resin. Let the covered surface cure and dry. You might think that the tissue

would stick to the cloth or pull it off the surface and result in a sticky mess. Be assured that it won't. After the resin has hardened, sand the surface just enough to remove any high spots — don't sand too much or you'll sand the cloth right off! Next, I used K & B Superpoxy Primer which was sanded to a smooth surface and R & S Perfect camouflage enamels. The top surfaces were done with

#PC-51 Japanese Naval Green and the bottom with #PC-36 Light Gray. Rivet and panel detail was added with a technical drafting pen and acetate based ink. The cowl was painted with R & S black and the insignias were made from trim MonoKote, which was wet sanded first to give it a flat look. The entire model was then covered with R & S clear satin finish. While you can use the shrinkable







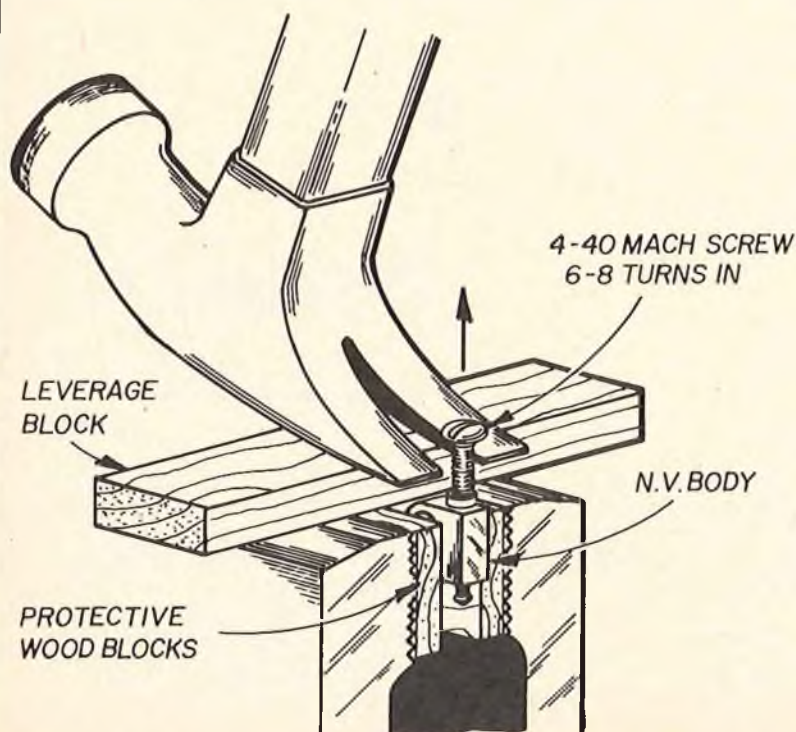
# HERE'S HOW

THERE IS NO DOUBT ABOUT IT! THE COX TD .049/.051 IS DESTINED TO FOLLOW THE POPULARITY CURVE THAT GAVE US THOSE SUPER .15's, .40's AND .60's WE NOW ENJOY. AS THE SPOTLIGHT BRIGHTENS ON THE TD WE CAN EXPECT TO SEE SOME IMPROVEMENTS AS MANY KNOWLEDGEABLE PEOPLE ARE WORKING WITH THESE SMALL BUT POWERFUL ENGINES. FROM SOME HAVE COME INNOVATIVE IMPROVEMENTS. ONE SUCH IMPROVEMENT FROM GEORGE MATTEI OF HAMDEN, CONN. IS SHARED WITH US. GEORGE REWORKS ENGINES AND SELLS SPECIAL PRODUCTS AS A SIDELINE. HIS IDEA OF MODIFYING THE TD CARB BODY, AS PRESENTED BELOW, CAN BE DONE WITH LITTLE COST AND BY ANYONE WITH AVERAGE SKILLS. I PERSONALLY HAD NO TROUBLE MODIFYING TWO CARB BODIES WHILE CHECKING OUT THIS MODIFICATION.

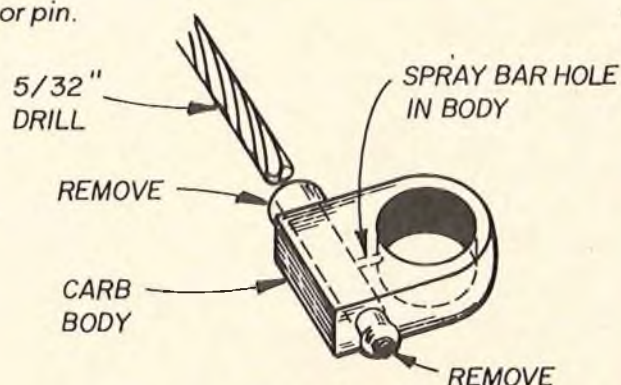
BEFORE BATTERING UP YOUR LITTLE JEWEL, IT IS NECESSARY TO HAVE IN HAND A NEEDLE VALVE ASSY AS USED ON THE COX READY-TO-FLY U-CONTROL. COX HAS SOLD THOUSANDS OF THEM AND IT SHOULD'NT BE MUCH TROUBLE TO RUN ONE DOWN IN YOUR NEIGHBORHOOD. THE MORTALITY RATE IS QUITE HIGH ON THESE AIRCRAFT. LOOK FOR A CARB/MOUNT THAT REQUIRES AN EXTERNAL TANK. IT WILL BE NECESSARY TO REMOVE THE SPRAY BAR AND NEEDLE VALVE FROM THIS ASSY TO REPLACE YOUR PRESENT N.V. ASSY. IF YOU CANNOT LOCATE ONE (FREE) COX WILL BE HAPPY TO SELL YOU A CARB/MOUNT AND N.V. FOR ABOUT \$2.75. TRY THE FREE ROUTE FIRST, BY ALL MEANS.

THE BIGGEST ADVANTAGE IN THIS NEEDLE VALVE REPLACEMENT IS A MUCH BROADER ADJUSTMENT ALLOWING YOU TO "TUNE IN" WITH EASE. THE SHORT PIECE OF NEOPRENE TUBING PREVENTS AIR LEAKAGE AROUND THE THREADS AND HOLDS THE NEEDLE VALVE ADJUSTMENT FIRM. WHY NOT GIVE IT A TRY!

1. remove needle valve body from engine. remove n.v. from body. clamp n.v. body in vise with rubber lined jaws or two blocks of pine wood instead to protect n.v. body from damage. clamp extra tight. insert 4-40 screw into n.v. threads and screw in at least 6-8 turns. use claw hammer, as shown, to remove n.v. spray bar from body.



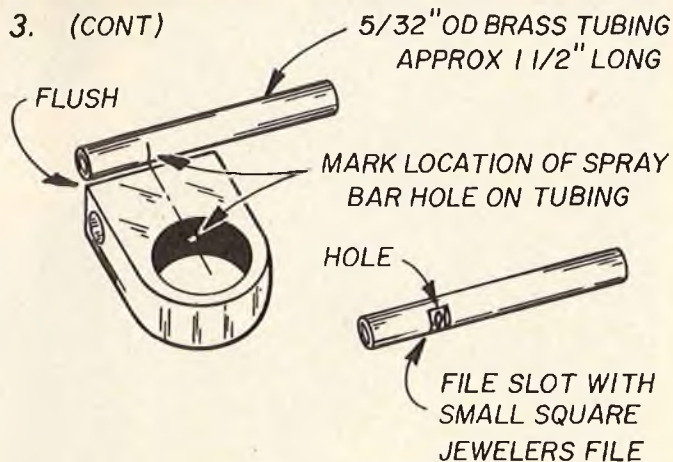
2. drill out hole, from needle valve side, with 5/32" drill. drill all the way through to other side. it is important to drill as straight as possible. file both sides flush with fine file and deburr hole with exacto knife. clean spray bar hole in n.v. body with small piece of music wire or pin.



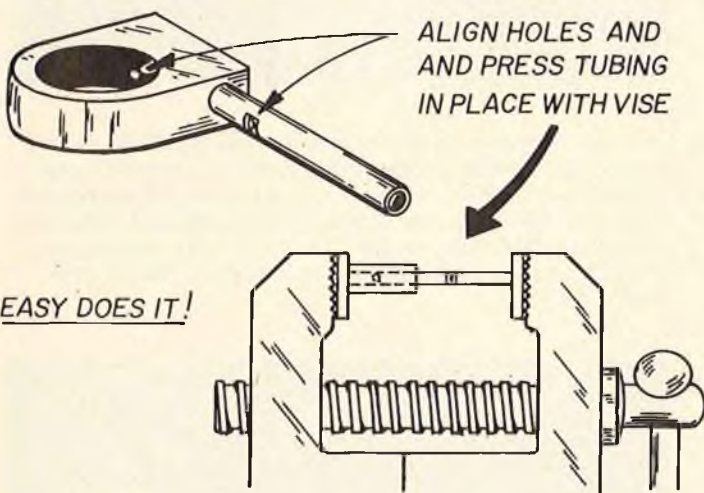
3. place 5/32" od brass tubing on top of n.v. body and mark location of spray bar hole as shown. file slot in tubing at mark and deburr. deburr inside of 5/32" tubing with 1/8" od tubing pushed thru it. size of hole is not important however, it must be aligned with hole in needle valve body when layed on top for alignment check as shown in sketch.



3. (CONT)

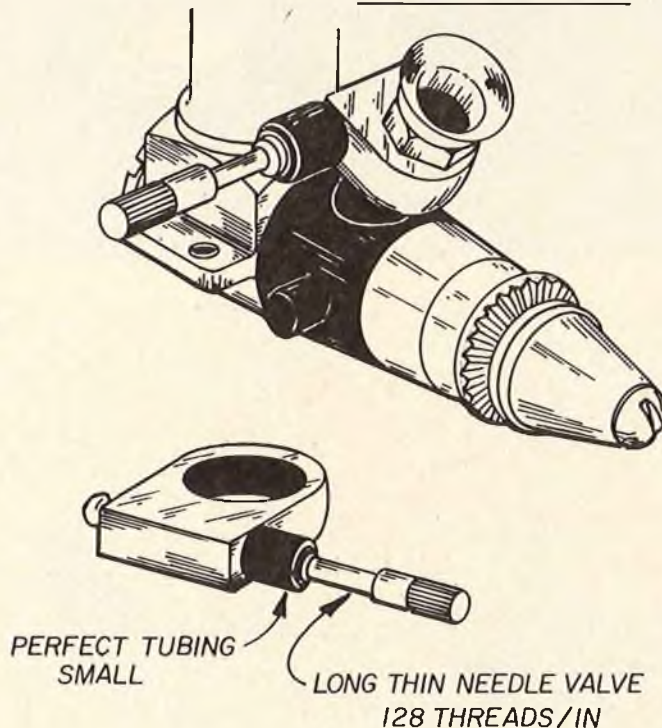


4. start tubing into n.v. body with holes aligned as shown, press in, with vise jaws, until tube is flush with far side. cut-off excess tubing with hacksaw or dremel cutoff wheel. trim flush with n.v. body and file smooth. deburr both sides. countersink both sides with 11/64" drill by twisting drill in fingers. countersink is important for a good epoxy seal.



6. cut short length of PERFECT (small) black neoprene tubing and slip on needle valve side. this serves to: seal threads against air leakage and; keep needle valve adjustment firm. insert needle valve into body and hookup fuel line. blow thru fuel line to assure holes in needle valve body are aligned and open.

COX TD.049/051  
WITH MODIFIED CARB



TOOLS REQUIRED

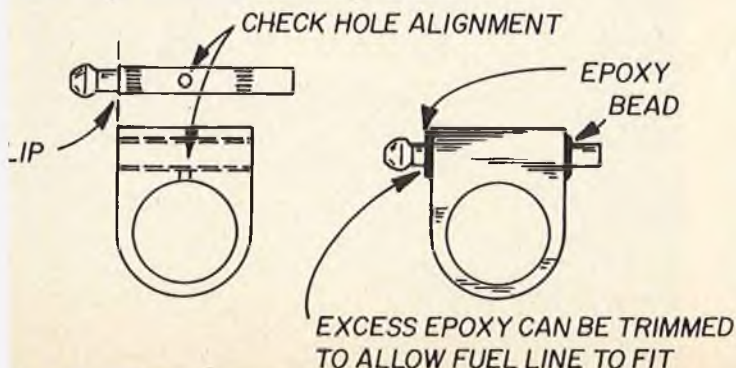
WISE	CLAW HAMMER
* ELECTRIC DRILL	SCREWDRIVER
5/32" DIA DRILL BIT	JEWELERS FILE - SQ.
FILE, FINE	STRAIGHT PIN
HACKSAW	WOOD BLOCKS - 2" X 2"
EXACTO KNIFE - #11 BLADE	
* Drill press would do better.	

MATERIALS REQUIRED

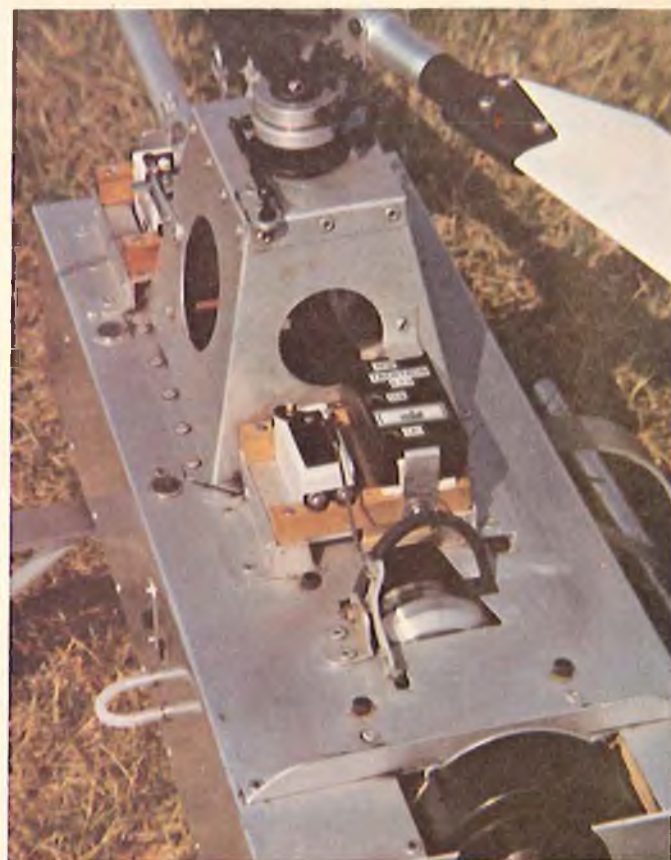
5/32" OD BRASS TUBING  
PERFECT NEOPRENE (BLACK) TUBING - SMALL  
5 MIN. EPOXY  
NEEDLE VALVE ASSY. - FROM COX READY-TO-FLY  
CONTROL LINE PLANE. MUST BE ENGINE WITHOUT TANK  
MOUNT - THIN NEEDLE VALVE END - NOT LARGE FLAT  
ONE. NEEDLE VALVE ASSY. MUST BE REMOVED FROM  
PLASTIC CARB/MOUNT ASSY. CAN BE FOUND IN MOST  
MODEL SHOPS OR FROM FRIEND WHO BOUGHT ONE  
FOR SON. IF ALL ELSE FAILS CARB/MOUNT AND NEE-  
DLE VALVE CAN BE PURCHASED FROM COX.

CARB/MOUNT #1259 - \$1.75  
NEEDLE VALVE #1968 - \$1.00

5. before installing new spray bar, clean it thoroughly so epoxy will stick. insert n.v. spray bar into body. be sure lip is flush with body side. when completely aligned apply bead of 5 min epoxy at both ends. be neat with epoxy application. allow to dry thoroughly before turning in needle valve. alignment of hole in housing and hole in spray bar is most important.







*The author's helicopter shown with radio and tachometer, plus in-flight shots with governor-collective pitch control system in operation. Shown above is the throttle servo and governor, fuel loop, rear blower on Webra Speed and timing wheel. BELOW: Servo installation. Note collective tail rotor mixing. Left bellcrank is tail rotor while right bellcrank is collective.*







*The author, Al Irwin, with his test helicopter, Royal radio, and precision tachometer.*

# TACH-TRON HELICOPTER CONTROL SYSTEM

THIS MODEL HELICOPTER GOVERNOR-COLLECTIVE PITCH CONTROL SYSTEM IS A REVOLUTIONARY BREAK-THROUGH IN RC HELICOPTER FLYING AND ONE THAT HAS BEEN THOROUGHLY FIELD TESTED BY SEVERAL OF THE COUNTRY'S TOP CHOPPER PILOTS.

BY AL IRWIN (N61E)

PHOTOS BY DAN PITT

● The device which will be described herein, was initially named the Autocon. It was later found to be in conflict with an existing trademark, and it was renamed the Tach-Tron. Patent rights are in process, and U.S. manufacturing rights have been assigned to Royal Electronics Corp., in Denver, Colorado.

Before going into the actual design, I will say something about the thoughts which led to its existence. The first machine to be built and flown by myself was a Schluter Cobra. It proved to be a good trainer, and many enjoyable afternoons were spent at the site, in command of "the beast." After a full year of flying it, the itch began to take hold for a

## PART ONE

collective pitch machine. There had to be a reason for using pitch control on the full size machine. One can quickly conclude that it is for better up/down control. I was always aware of the time delay on the throttle, and thought that if this was scaled up to a full sized machine, one would find it all but impossible to fly them. If pitch helped the full sized machine, it should help the model for a better response.

I checked the collective type kits and found that the suggested method was to couple the throttle and pitch on one channel. It seemed to me that this would

still be a form of "flying the throttle." Why not, I thought, fly pitch only. To do this, one would have to have "fixed" RPM, which would require a governor. The slew rate (time lag) of a mechanical governor would probably be too great, but this may not be true with an electronic one. If an electronic one could be built which was fast as the servos, we would be in business. I should mention that patent searching revealed three patents for governors on full-sized machines, and some full-sized helicopters do make use of them. They also make use of autocollective systems.

If one went back a couple of years, machines were not all that common in

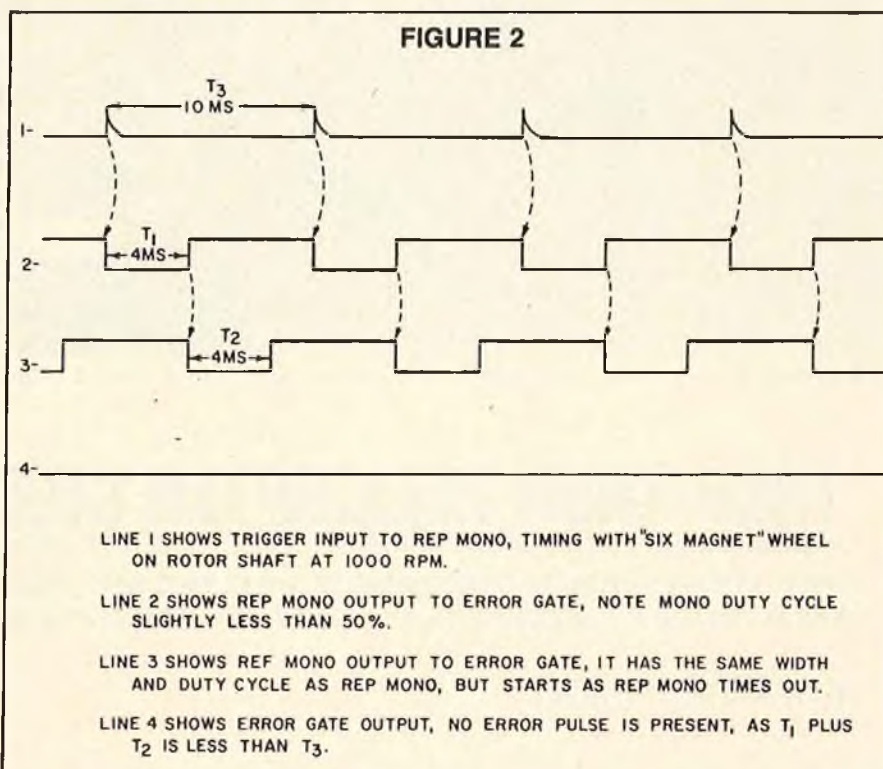
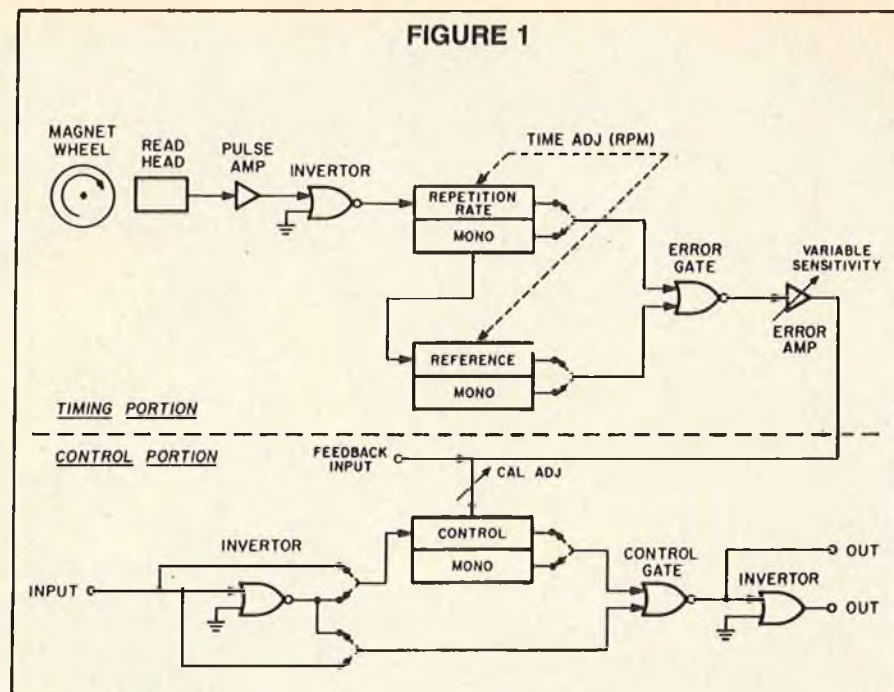


#### ABOUT THE AUTHOR

Al Irwin has had contact with both the model and full scale aircraft since early high school days. He worked at a small private airport as an apprentice A & E mechanic, became licensed, also took flying lessons and obtained his pilot's license during these years. He later served with the U.S. Air Force as a Flight Engineer on B-17's. Upon leaving the Air Force, he started his electronics career at which he has worked for 23 years. Eight of these years were with the Illinois Power Company, where he became a carrier current specialist and dealt with microwave, load control, and telemetering systems. In 1959, he left this firm and joined the University of Illinois Department of Computer Science. He served in many facets in the design and construction of the Illiac II Computer. In 1966, he joined the Circuits Research Group under the direction of Professor W.J. Poppelbaum within the Computer Science Department. He has worked in many areas of information engineering and processing while serving this group as an Assistant Research Engineer. He took up radio control modeling in the latter part of 1968, and in 1969 developed the TWINTROL system. A Goldberg Skylark in the twin engine form was used as a test platform at that time, and is still intact and functional. Al has also led the Champaign County R/C Club in various projects such as designing and building 33 club systems. Al is also holder of amateur radio license W9LXP, FCC commercial license P2-18-19236, and CB KAZ-0800.

our locality. After covering some distance, and making many phone calls, I did manage to talk to others who were trying collective. I learned of another problem which they were having which was that of getting the pitch and power curves to track. With coupled throttle and collective, this can present some difficulties. The power curve must always remain above the pitch curve. The engine must be able to push the pitch load which you give it, without loss of RPM. If the engine can do this, it is "staying on top" of the situation. You have the two mechanically coupled, you adjust linkages, change to different holes in the servo output and bellcranks, and finally you make it. It flies good and you pat yourself on the back. Tomorrow you go out and old man barometer has changed, so you adjust the needle. The throttle barrel is opened a little more to get the same power output, but you have more pitch for the same amount of power. They are coupled, remember? Day to day changes can be noticed, unless you have a surplus of power. Schneurle ported engines have helped with this problem.

Another answer to this would be to uncouple them, this would mean two controls, or make one automatic. If you fly throttle, the pitch could be automatic. If you fly pitch, the throttle could be automatic. The automatic control would always be related to, and would be a function of, the manually controlled channel. They would be indirectly coupled. To accomplish this, the device would take on two forms. It would be a

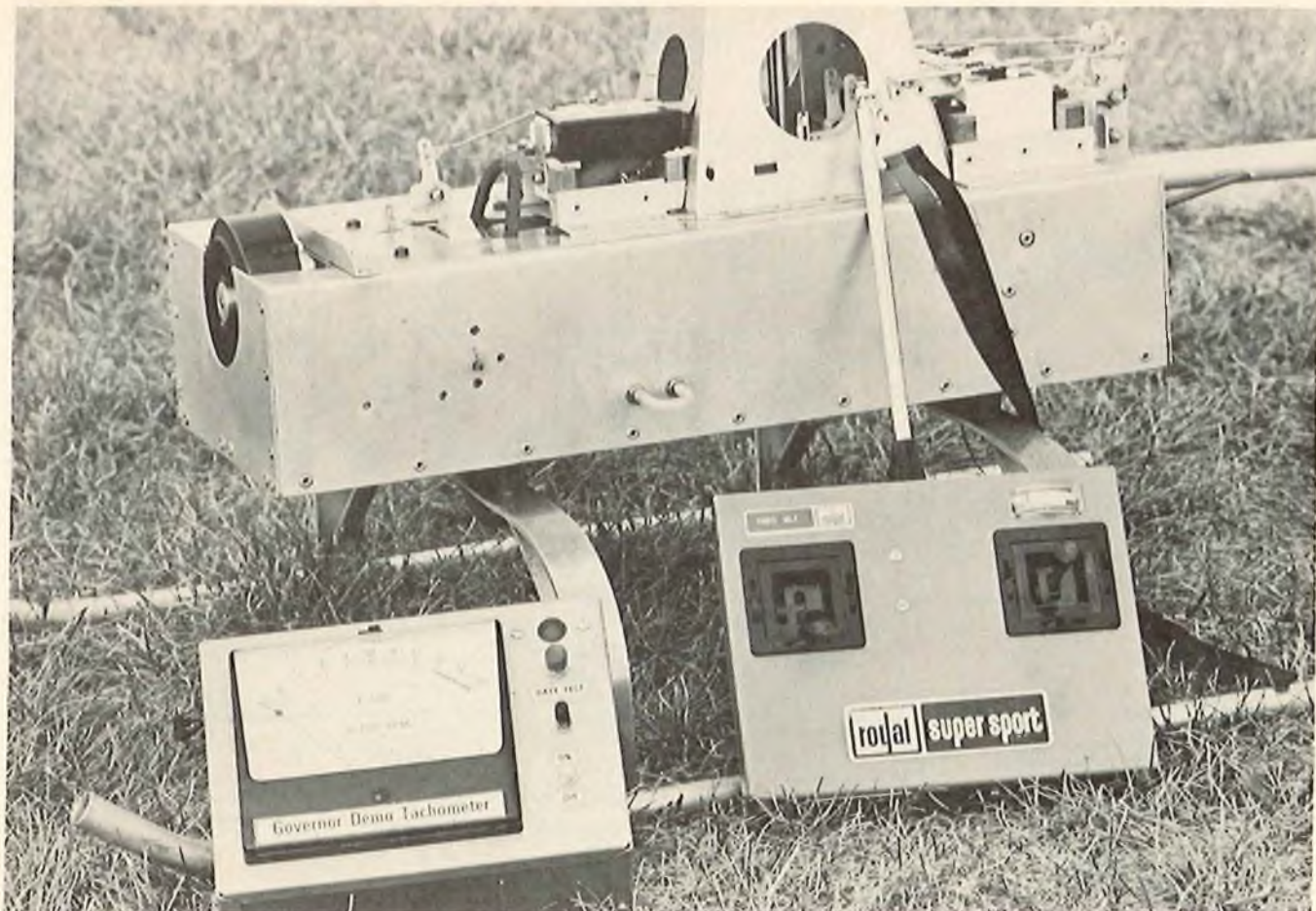


governor or an autocollective device. Now to put a little more flak in the way, you can think about the R/C systems on the market. Some are negative pulse systems and some are positive pulse systems. Most all move the servo from one end of its travel to the other, with a pulse width change of approximately one millisecond. Some start at 1 ms and go to 2 ms with control advance, others start at 2 ms and go to 1 ms with control advance. If a device were designed to meet all of these requirements, it would take on eight variations. It could be a positive or negative 1 to 2 or 2 to 1 governor, or the same variations for collec-

tive.

Electronics is my profession, and I could see this to be a great challenge. I decided to have a go at it and got my feet wet. I purchased a collective pitch machine. Two machines were available at the time. Both kits were checked to see which would make the best "test bed" for the project. It seemed that it would be best not to put the mechanics in the fuselage provided, but to build up something else so that everything was exposed for easy access. I checked the Kavan Jet Ranger and the Graupner 212. Both were found to be excellent kits, but I did not like one thing about





**Detail of machine, tach and radio. Throttle control is left of left stick, Idle is right of left stick. There is no trim on the left stick which is collective, except below it, which is tail rotor trim. On the right stick, inside and bottom trims are cyclic. The outside lever is auxillary control on the sixth channel.**

each. I did not like the moving servo tray in the Kavan. It appeared that this could present a problem in adapting the mechanics to another fuselage (this has since been modified in the Kavan), and I did not like being restricted to one type of engine in the Graupner. This also can be corrected. I am flying a Webra Speed in mine now, and have been for quite some time. A new crank pin and case back was made for the Speed and the blower was transferred from the HB engine. It is doing very well. From this, you can tell which I bought, the 212. An aluminum fuselage was constructed. Although it was meant to be practical and not pretty, its appearance does "grow" on you after a period of time. More will be said about it later as the fuselage would make a good training gear. With slight modifications, the technique could be applied to other types of mechanics. The fuselage cost was \$12.00. It made a good test bed and has survived it all.

With the foregoing in mind, we can now talk about the device. It is called the Tach-Tron and was designed with two objectives in mind. The first was to have a governor so that one would have instant response if flown by pitch. In this form, the torque problem disappears, since rotor speed is constant and torque changes due to pitch can be removed

with collective/tail rotor mixing. The term "constant" does *not* mean zero change in the shaft speed since a governor adds power as the result of an error in RPM. The Tach-Tron, with its sensitivity adjustment at maximum, can move the servo through its full travel range with a 15 RPM error. In actual application, one

cannot set the sensitivity this high, as the system will "hunt." Feedback is used in the governor to reduce this effect, but even with this, one can expect a 20 to 30 RPM change from zero to full collective. If you multiply this by 10 for the approximate gear ratio, you are controlling the engine to about 200 or 300 RPM. This

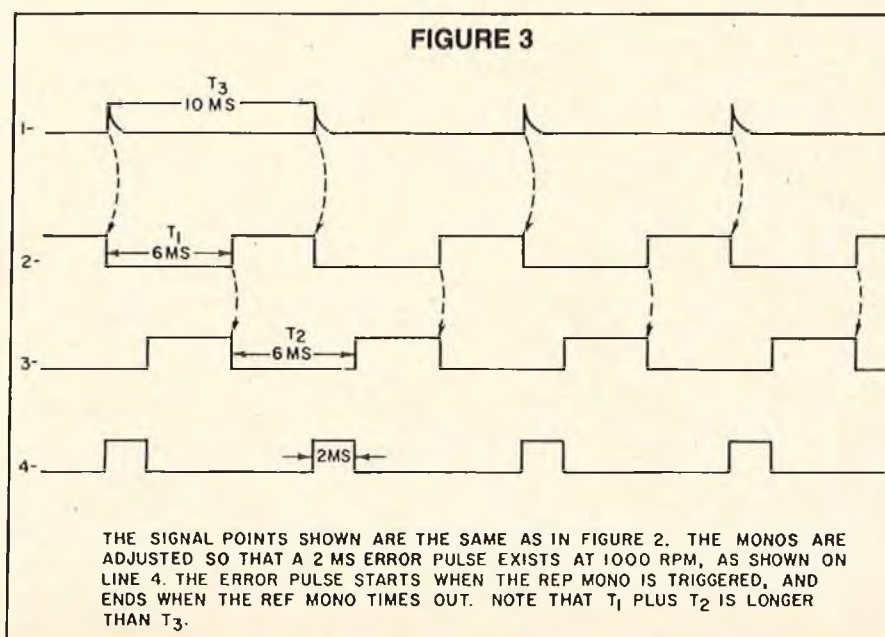
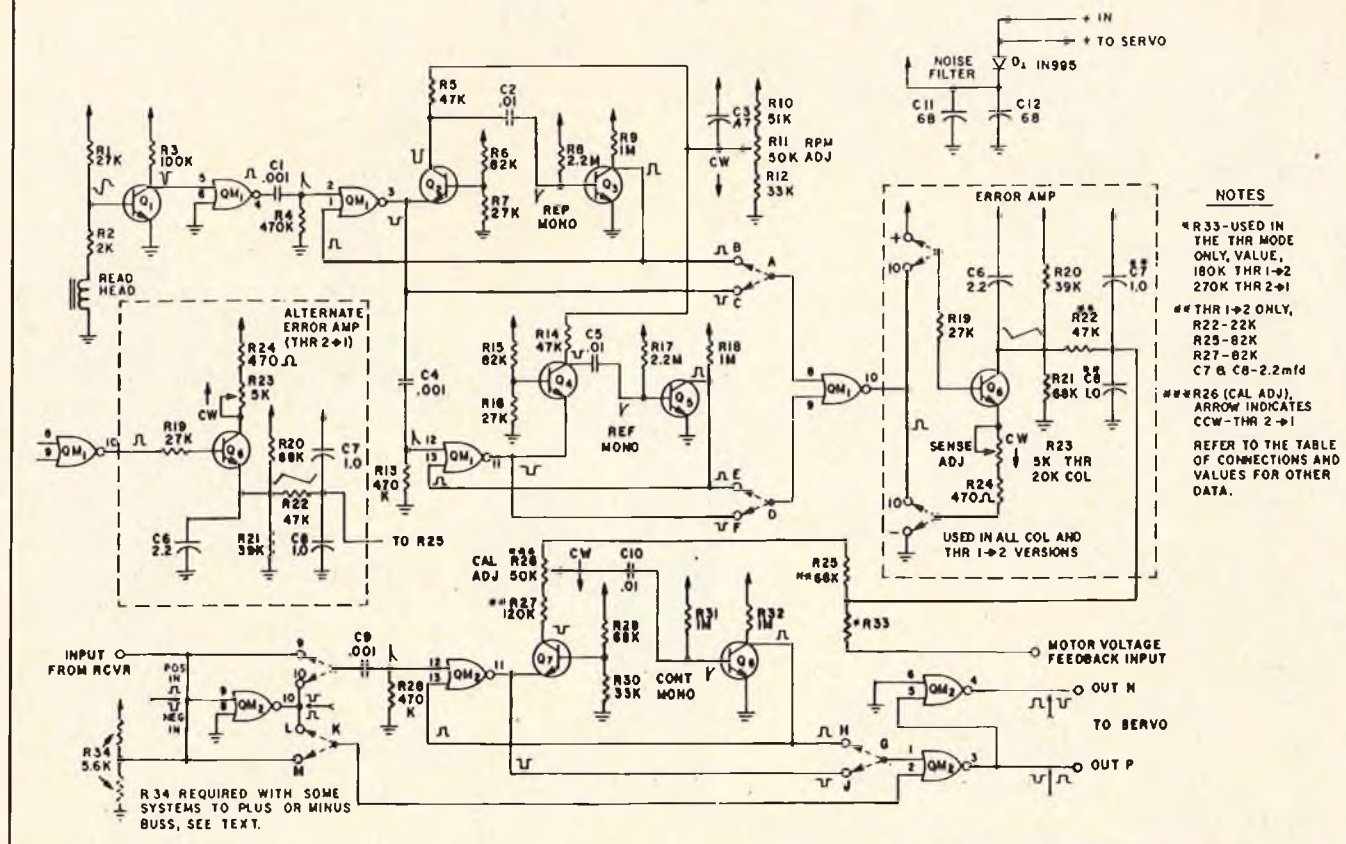




FIGURE 4



small change over a full pitch change does not produce a noticeable torque effect. The second objective was to uncouple the throttle and pitch for those who still wish to fly throttle. This is done

with the autocollective versions. In this form, torque will still be present, but it can be minimized since the pitch slope is adjustable in the Tach-Tron. It can be made to track slightly behind the engine.

The engine actually adjusts its own work load. If it produces the power and RPM, it adds its own pitch. If it sags from heat or a lean setting, it reduces the load, helping it to recover. The Tach-Tron was test flown in both versions and produced excellent results in either form. There are several of them on other modelers' machines now, but to date I am the only one who has flown the autocollective version. The others have selected the governor form for the precision up/down control capability.

Several methods of taching the RPM were evaluated, and the version used offered the most advantages. To sample the main shaft RPM, a nylon wheel was constructed containing four magnets. It was mounted on the main rotor shaft and "sensed" with a read head. The head used was an erase head of the standard cassette type. It was selected because of its very narrow pole piece. The magnets are wider on the face than the pole piece. As the magnet approaches the pole piece, there is a voltage build-up in the head winding. Once the magnet is in front of the pole, the flux density will not change, until the magnet is leaving the pole. Since the magnet is wider than the pole, this will take a little time. With no flux change, the voltage in the head collapses and "rings" in the opposite direction, providing a nice pulse. The rise time of the voltage building in the head as the magnet approaches, is not as sharp as the ringing voltage when the collapse

FIGURE 5

TABLE OF CONNECTIONS AND VALUES

MODE	CONN A TO	CONN D TO	CONN G TO	CONN K TO	CONN R19 TO	VALUE R20	VALUE R21	CONN R24	CONN C6	CONN C9	OUTPUT POINT
COL POS 1-2	B	E	H	M	QM1 10	39K	68K	GND	+	QM2 9	N
COL NEG 1-2	B	E	H	L	QM1 10	39K	68K	GND	+	QM2 10	P
COL POS 2-1	B	E	J	L	+	39K	68K	QM1 10	+	QM2 9	P
COL NEG 2-1	B	E	J	M	+	39K	68K	QM1 10	+	QM2 10	N
THR POS 1-2	C	F	J	L	QM1 10	39K	68K	GND	+	QM2 9	P
THR NEG 1-2	C	F	J	M	QM1 10	39K	68K	GND	+	QM2 10	N
THR POS 2-1	C	F	H	M	QM1 10	68K	39K	+	GND	QM2 9	N
THR NEG 2-1	C	F	H	L	QM1 10	68K	39K	+	GND	QM2 10	P



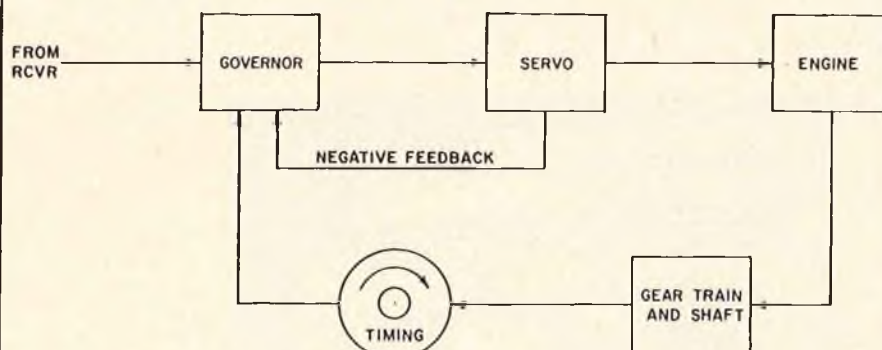
takes place. Since the fast rise pulse can provide more reliable triggering, this is the one we use. The ringing voltage is opposite in polarity on a CCW rotation rotor from that obtained from a CW rotor, because the magnet approaches the head from the opposite direction. The head must be inverted, or its leads reversed to correct the polarity.

The magnets used in the wheel measure 1200 gauss, which is quite strong for the size. Using a stock cassette head with these magnets still did not give good triggering at lower RPM. Heads with a higher number of turns were ordered, and triggered well within the desired limits. The first shipment of heads were in the standard cassette head case. These have two small screws on the bottom which are a slight problem when mounting the head. A new nylon cased head has now been produced, and when the first ones are used up, the nylon case will be standard stock, as long as the heads are used. At the time of this writing I am conducting tests on an alternate device for sensing the magnets, which would allow smaller magnets and smaller timing wheels. This would adapt them to smaller machines where space for the wheel is a problem.

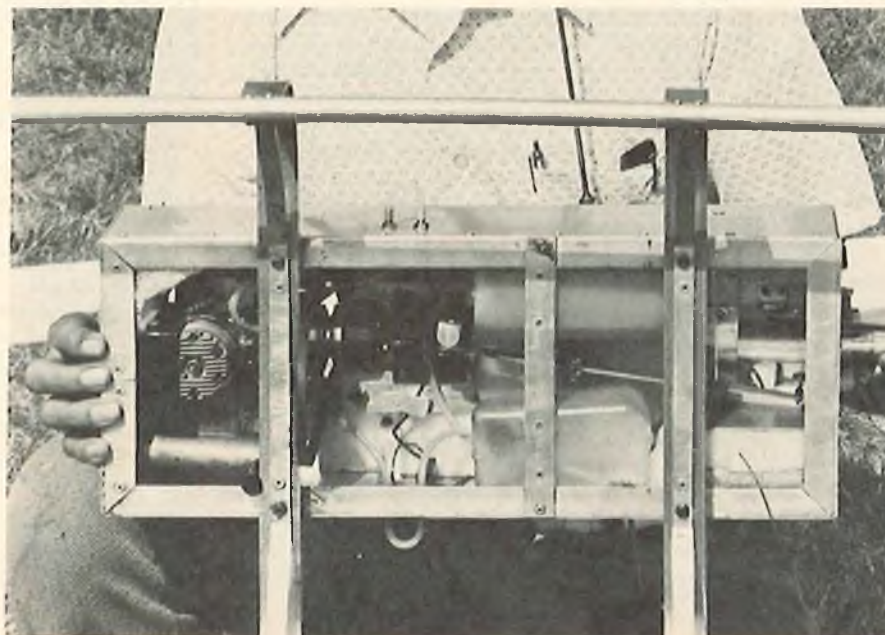
With four magnets, at 900 rotor RPM, 3600 pulses per minute was produced. This gave high resolution, and a side benefit. The 60 hertz line voltage could be used, (properly reduced in magnitude), as a simulated 900 RPM for bench testing. It also produced another effect which was not desirable. I found that at governor RPM settings slightly less than 1000 RPM, the RPM would vary up and down and the helicopter would wag its tail like a puppy. It was a definite pattern and would, with hands off trimmed hover, go on as long as I allowed. After much head scratching and frustration, it was traced to the slip or beat frequency, between the incoming trigger rate from the taching wheel, and the transmitter frame rate. A five channel system was being used. With five channels at 2 ms maximum and a 5 ms sync gap, the frame time was in the order of 15 ms. If you get four pulses per rotation, and wind it up to 1000 RPM, guess what your pulse spacing is? It is 15 ms. The problem was solved by going to six magnets, the pulse rep rate with six at 1000 RPM is 10 ms. This moves it away from the frame time of a five channel to page 132

**CENTER, RIGHT:** Full view of Al's helicopter from front. Pop rivets used in construction. **RIGHT:** Bottom view showing Webra Speed, twin tanks on C.G. Note pressure system from muffler to overflow loop, to vent in first tank; from clunk in first to vent in second; from clunk in second to fill loop; and from loop to fuel filter and on to carburetor. A 10 and a 12 ounce tank for a total of 22 ounces of fuel. The ten ounce tank, located next to muffler, empties first.

FIGURE 6



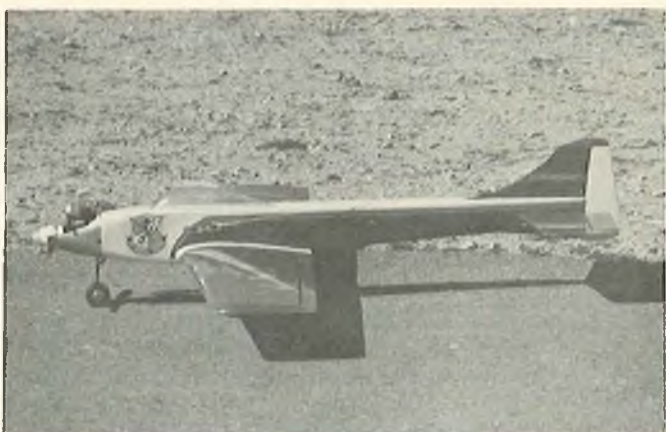
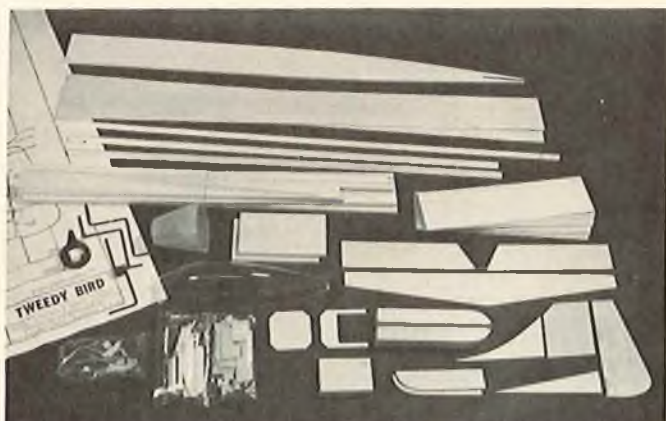
THE SYSTEM IS SHOWN ABOVE, AS IT FUNCTIONS IN A CLOSED LOOP. NEGATIVE FEEDBACK ALLOWS HIGHER GOVERNOR SENSITIVITY SETTINGS, GIVING TIGHTER ENGINE CONTROL WITHOUT "RPM HUNTING". WEIGHTED ROTORS REDUCE ACCELERATION, WHICH IS A FORM OF GAIN IN THE LOOP. THIS MAKES STILL HIGHER SENSITIVITY SETTINGS POSSIBLE, WITHOUT HUNTING.





# RCM PRODUCT TEST

**BRIDI HOBBY ENT.  
TWEEDY BIRD**



● The Tweedy Bird is a sport and pattern aircraft manufactured by Bridi Hobby Enterprises, 1611 E. Sandison St., Wilmington, California 90744. Designed by well-known pattern flyer, Joe Bridi, this low wing pattern and general sport aircraft has a wing span of 48¾" and a total wing area of 400 square inches and is designed for .15 to .30 cubic inch displacement engines. Four channels of control are required for rudder, elevator, throttle, and ailerons.

The basic materials used in the construction are conventional balsa and hardwood. The hardware in the kit include the main landing gear, steerable nose gear with associated hardware, main gear hold-down straps and screws, motor mounts and mount screws, nuts, control horns, canopy, pre-formed epoxy cowling and aileron torque rods. There is one plan sheet measuring 50" x 30" with building instructions included on the plan sheet in addition to a 15 page instruction manual. Parts are machine cut.

The weight of our prototype ready to fly was 56 ounces for a wing loading of 19 ounces per square foot. RCM's prototype was covered with Super MonoKote and Bridi Striping Tape. An OS Max .35 engine with Max muffler was used while the radio was a Kraft Gold Medal Series with KPS 12 servos. While this was a well-designed model with clear and precise instructions, we found the following changes necessary in our particular kit. On page 3 of the instructions, while the plans and instructions call for the sheeting to come over the spar, the ribs were cut so that the sheeting (top front and bottom wing) fit flush to the front edge of the main spar. Either the ribs should be die-cut or the plans and instructions modified. Since that time Bridi Enterprises has machine cut all the ribs and cap strips have been added to the kit. On page 4, the instructions should refer to the

to page 128

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	●					Pre-Shaped Parts		●			
Plans	●					Parts Match to Plans	●				
Written Instructions	●					Overall Parts Fit	●				
Quality of Hardwood	●					Ease of Assembly	●				
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials	●					Flight Performance	●				
Accessories	●					Overall Appeal	●				
Die-Cutting		●									

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

## SPECIFICATIONS

Name	Tweedy Bird
Aircraft Type	Sport-Pattern
Manufactured By	Bridi Hobby Enterprises 1611 E. Sandison Street Wilmington, California 90744
Mfg. Suggested Retail Price	\$43.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Low Wing Pattern, General Sport
Wing Span	48¾ Inches
Wing Chord	9½ Inches
Total Wing Area	400 Square Inches
Fuselage Length	42 Inches
Radio Compartment Dimensions	(L) 8" x (W) 2½" x (H) 2"
Wing Location	Low Wing
Airfoil	Symmetrical
Wing Planform	Swept L.E.
Dihedral	1/4 Inch
Stabilizer Span	20¾ Inches
Stabilizer Chord (incl. elev.)	6¾ Inches
Total Stab Area	132 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Mid-Fuselage
Vertical Fin Height	7¼ Inches
Vertical Fin Width (incl. rud.)	11 Inches
Mfg. Rec. Engine Range	.15-.30
Recommended Fuel Tank Size	4-6 Oz.
Landing Gear	Tricycle
Recommended No. Of Channels	4
Recommended Control Functions	Rud., Elev. Throl., All.
Basic Materials Used In Construction:	
Fuselage	Balsa
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	50" x 30" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (15 pages)
Construction Photos	No
Kit Includes	Shaped & Die-Cut Parts
Mfg. Rec. Flying Weight	3½ Pounds
Wing loading based on rec. flying wt.	Not Given

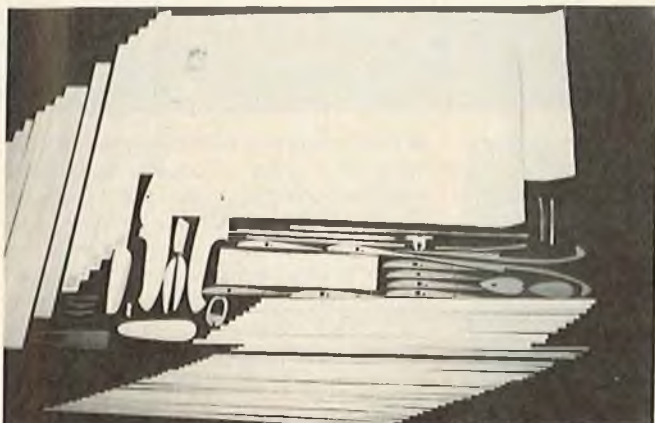
## RCM PROTOTYPE

Weight, Ready To Fly	56 Ounces
Wing Loading	19 oz./sq. ft.
Covering & Finishing materials used	MonoKote, Trim Kote, Bridi Tape
Engine Make & Disp.	O.S. Max .35
Muffler Used	O.S. Max
Radio Used	Kraft Gold Medal
Tank Size Used	6 Ounce



# RCM PRODUCT TEST

## LEGIONAIR SAILPLANES LEGIONAIR 100



● The Legionair 100, designed by Cecil Haga and manufactured by Legionair Sailplanes, 3017 Norwood, Arlington, Texas 76013, is available direct from the manufacturer and retail outlets with a suggested retail price of \$74.95. It is a Standard Class competition sailplane which is also excellent for general sport flying. With a wingspan of 100", it has a total wing area of 933 square inches and utilizes a flat bottom airfoil. The center panels of the wings are constant chord with swept tips. The Legionair 100 is designed for 3 channels operating rudder, elevator, and landing spoilers as well as a releasable tow hook. The basic materials used in the construction include fiberglass and metal tubes in the fuselage, a metal tube spar with balsa and plywood utilized in the wing, and conventional balsa tail surfaces. The releasable tow hook is included in the kit. The plan size is 24" x 50" and there are two sheets with building instructions included on the plan sheets in addition to a ten page instruction manual. Parts are both die-cut and shaped. Unusual features of the kit include a metal tail boom and metal wing spars, a fiberglass pod, huge and very effective spoilers, a four piece wing and bolt-on tail, as well as unusually comprehensive flight instructions included in the construction manual. In addition, the wing is designed for inter-changeability with the Legionaire 140.

Our prototype, ready to fly, weighed 46.5 ounces for a wing loading of 7.1 ounces per square foot. Our flying surfaces were covered with MonoKote and an EK-logictrol three channel radio was used. With regard to the kit, we find that it is a fine, comprehensive, and beautifully detailed kit, but one where the builder must pay careful attention to alignment details and follow the instructions to the letter. With regards to the flight performance we must say that the Legionair 100 undoubtedly ranks as one of the best all around Standard Class sailplanes we have flown to date. □

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	●					Pre-Shaped Parts	●				
Plans	●					Parts Match to Plans	●				
Written Instructions	●					Overall Parts Fit	●				
Quality of Hardwood		●				Ease of Assembly	●				
Quality of Fiberglass	●					Fidelity to Scale			NA		
Other Materials	●					Flight Performance	●				
Accessories	●					Overall Appeal	●				
Die-Cutting	●										

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

## SPECIFICATIONS

Name ..... Legionair 100  
Aircraft Type ..... Sailplane  
Manufactured By ..... Legionair Sailplanes  
3017 Norwood  
Arlington, Texas 76013

Mfg. Suggested Retail Price ..... \$74.95  
Available From ..... Both Mfg. & Retail  
Mfg. Recommended Usage ..... Sport & Competition  
Wing Span ..... 100 Inches  
Wing Chord ..... 10.5 Inches  
Total Wing Area ..... 933 Square Inches  
Fuselage Length ..... 44 Inches  
Radio Compartment Dimensions ..... (L) 7" x (W) 2" x (H) 2"  
Wing Location ..... Shoulder Wing  
Airfoil ..... Flat Bottom  
Wing Planform ..... Constant Chord & Swept L.E.  
Dihedral ..... 3 Degrees  
Polyhedral ..... 4 Degrees  
Stabilizer Span ..... 24 Inches  
Stabilizer Chord (Incl. elev.) ..... 6 Inches  
Total Stab Area ..... 144 Square Inches  
Stab Airfoil Section ..... Flat  
Stabilizer Location ..... Mid-Fuselage  
Vertical Fin Height ..... 12 Inches  
Vertical Fin Width (Incl. rud.) ..... 7"  
Mfg. Rec. Engine Range ..... NA  
Recommended Fuel Tank Size ..... NA  
Landing Gear ..... Skid  
Recommended No. Of Channels ..... 3  
Recommended Control Functions ..... Rudder, Elevator & Spoilers  
Basic Materials Used In Construction:  
Fuselage ..... Fiberglass  
Wing ..... Balsa & Ply  
Tail Surfaces ..... Balsa  
Hardware Included In Kit ..... Releasable Tow Hook  
Plan Size ..... 24" x 50" (2 sheets)  
Building Instructions on Plan Sheets ..... Yes  
Instruction Manual ..... Yes (10 pages)  
Construction Photos ..... No  
Kit Includes ..... Shaped & Die-Cut Parts  
Mfg. Rec. Flying Weight ..... 50 Ounces  
Wing loading based on rec. flying wt. .... 7 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly ..... 46.5 Ounces  
Wing Loading ..... 7.1 oz./sq. ft.  
Covering & finishing materials used ..... MonoKote  
Engine Make & Disp. .... NA  
Muffler Used ..... NA  
Radio Used ..... EK Logictrol  
Tank Size Used ..... NA



# EARLYBIRD



● Everything I've ever designed or built was for a need — usually because I needed something to fly. I don't use up a lot of airplanes, but I've "bought the farm" with (at least) my share over the years. It was never my fault, of course! Either I ran out of up (or down) and gravity got 180 degrees out of phase, with the ground coming up to meet my ship turning a figure 8 into a figure 9, or something . . .

The Earlybird wasn't designed just to have something to fly. At the time of its conception, I had three or four presentable, fine-flying birds ready to go, but I hankered for something a little different. Different is easy. Lots of ships are different — like green hair. But I wanted more than something different. I wanted a ship that was aerobatic, quick to build, and one with enough eye appeal to impress the crew at the local flying site — something with the flair and glamour of antique aviation — a new classic. And it had to be a bird which a new RC'er could assemble easily and quickly to use as a flying platform on which to build that (essential) 100 flights or so, leading to self-reliant RC proficiency.

Anything a beginner can keep together for that first 100 flights is an acceptable trainer, but "controlled", overly-stable (almost) free flights don't really teach anybody to fly. Although many mild pattern ships make fine first RC's, most newcomers are afraid of them. There are those fledgling pilots, of course, who want to start with a 4-engine amphibious flying boat or a bomber with retractable landing gear, operating gun turrets and bomb bay doors! If you're new to the sport, trust me. That ain't the way to go — honest!

I believe a newcomer to RC is entitled to a really jazzy, good flying first RC. Something that has enough eye appeal to ensure acceptance and maybe even a bit of admiration from one's modelport peers. A little shot for the ego - - - an attractive soul orchid, if you please. EarlyBird's open Warren-Truss fuselage fills the bill and turns heads at every

**Leroy Myers with EarlyBird biplane and low wing monoplane used by the M.A.R.K.S. Barnstormers Air Show Team for Eastern Shore shows. The EarlyBird biplane is a show-stopping winner for newcomer or expert.**



# Bipe

BY  
HOBIE STEELE



**An easy-to-build, aerobatic beginners bipe which experts enjoy - - - and with the classic appeal of a full scale antique. A two-winger, simple to construct for the inexperienced and docile enough for a first RC aircraft. Yet, the EarlyBird is agile aplenty for grandstanding barnstormers - - - mainstay of the MARKS Air Show Team.**

flying field I've been to, but mainly, we ended up with a fantastic flying machine for beginners and barnstormers alike.

EarlyBird is designed around a .19-.40 engine for a balance between transportability, economy, and consistent flight performance in even moderate winds. (If you're new, you might as well know — it's always windy on Sundays — unless you decide to take a day off from flying to go sailing, as we occasionally do down here on the Chesapeake Bay — then it's calm.

The first rough sketches were for a monoplane and were hardly finished before Wild Don Reynolds said he had to build one as a bipe. Some scissors and tracing paper quickly produced the EarlyBird Bipe and then it seemed everybody wanted to get in on the act, so the monoplane went on the back burner for

a while. Anyone who saw EarlyBird asked for plans and we soon had several bipes flying. Incidentally, the Sullivan PDQ foam wing (clipped) was used on one prototype and performed very well indeed. After slight fine-tuning of the prototypes, the design was finalized with ideas from several M.A.R.K.S. (Mid-Atlantic Radio Kontrol Society) members and here you are. I must say that I'm deeply grateful to Harold Ruark, Leroy Myers, John Chapis, Fred Adkins, Sam Fluharty, Chick Allen, and Bert Belt for all their help and encouragement on development of the design concept.

OK, you're sold. Get the goodies together and let's start building.

## FUSELAGE

Cut out 1/16" fuselage sides, 3/16" doublers, 1/4" balsa formers, and 1/4" ply firewall F-1. Then cover the fuselage

side shown on the plan with plastic wrap or wax paper before starting assembly. Build the right side by pinning down one doubler and gluing the 3/16" square spruce longerons to it, pinning to shape over the plan. Next, cut and glue the 3/16" square uprights and 3/16" x 1/8" diagonals, allowing the entire assembly to dry thoroughly.

When dry, carefully remove the pins from the framework and lay another piece of plastic wrap or wax paper on top of the open framework of the completed right side and build the left side directly on top of the right side and allow to dry. *Note* that the diagonals of the left side run in the opposite direction from those of the right side for the "X" effect of two (opposite) Warren Trusses.

Cut the 3/16" square top and bottom cross braces and 3/16" x 1/8" diagonals

**Hobie's "first wife" shows an EarlyBird bipe with low wing monoplane. EarlyBird of similar open fuselage construction on the ground. All three are barnstorming beauties.**







nals, then assemble the firewall, formers, and sides over the bottom view on the plan, checking alignment carefully. When dry, pull the fuselage sides together at the tail and glue in the bottom, then the top cross braces and diagonals, alternating the direction of the 3/16" x 1/8" diagonals as on the fuselage sides. If you cut the top and bottom pieces alike — at the same time — you'll end up with a square box (instead of a weird triangle). Check alignment and symmetry very carefully, allow to dry, and remove the structure from the plan. The 1/16" fuselage sides may then be laminated to the doublers and longerons with contact cement or epoxy.

The bottom is sheeted with 1/16" ply and the top with 1/16" balsa (applied with the grain running across instead of fore-and-aft). The tank hatch is 1/16" ply and held at the four corners with screws into the spruce longerons. The firewall is reinforced with triangular balsa stock. Drill for the wing hold-down dowels or install your favorite wing "holderons". Drill for the landing gear dowel and hold your bit *straight* so the holes are exactly the same on both sides.

Sand your EarlyBird's fuselage smooth being careful not to round off the corners too much. It's easy to get carried away at the corners resulting in a weak structure.

7/8" diameter circles can be cut from poster paper or thin cardboard for gussets, if desired. The cabane is assembled as shown on the plans and glued to the inside (or outside) the fuselage *exactly as drawn*. (If you're experienced, you can set them on an angle at the top fuselage corners but alignment and reinforcement is more difficult.)

#### EMPENNAGE

The stabilizer, fin, rudder, and elevator are all made from 1/4" sheet balsa as

#### TYPE AIRCRAFT

Sport Biplane

WINGSPAN

46 1/2 Inches

WING CHORD

8 Inches

TOTAL WING AREA

740 Square Inches

WING LOCATION

Biplane

AIRFOIL

Symmetrical

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

None

O.A. FUSELAGE LENGTH

36 Inches

RADIO COMPARTMENT AREA

(L) 10 1/2" X (W) 2 1/2" X (H) 3"

STABILIZER SPAN

21 Inches

STABILIZER CHORD (incl. elev.)

5 3/4" (Avg.)

STABILIZER AREA

121 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

7 Inches

VERTICAL FIN WIDTH (incl. rudder)

5 1/2" (Avg.)

REC. ENGINE SIZE

.19 — .40 Cu. In.

FUEL TANK SIZE

6—12 Ounce

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

Four

CONTROL FUNCTIONS

Rudder, Elevator, Throttle, Ailerons

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage ..... Balsa, Ply & Spruce

Wing ..... Balsa and Ply

Empennage ..... Balsa

Weight Ready-To-Fly ..... 72 — 80 oz.

Wing Loading ..... 14 — 15.6 oz./sq. ft.

*Hobie with two M.A.R.K.S. members EarlyBird Bipes — one with balsa wings and the other with Sullivan P.D.Q. foam wings (clipped). They are gentle yet magnificently maneuverable aerobatic cow pasture performers — even fly knife edge. Some are being flown in impromptu pylon races.*

indicated on the plans. Add aerodynamic balance "bumps" and round off all corners nicely. Note that the elevators are notched and joined with hardwood at the center.

The fin must be glued on the stabilizer absolutely square and reinforced as shown on the plans with balsa gussets. Use drawing triangles to be sure it is precisely perpendicular to the stab.

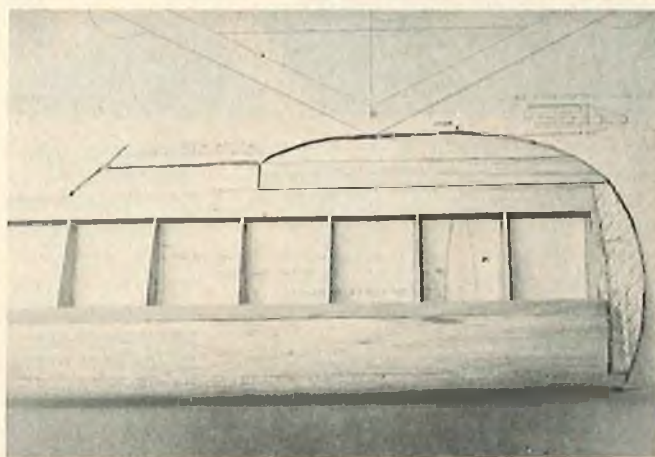
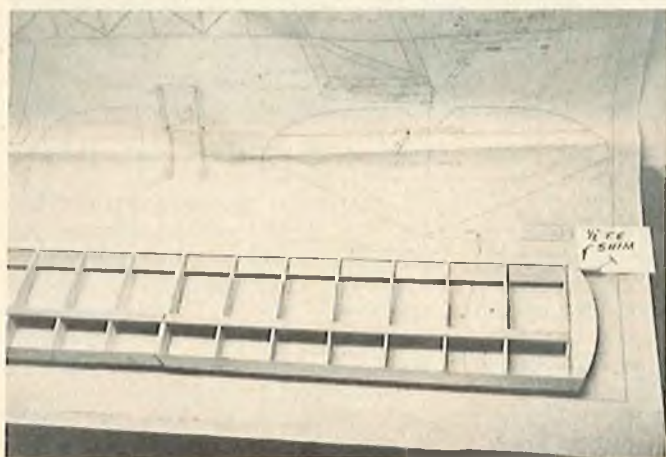
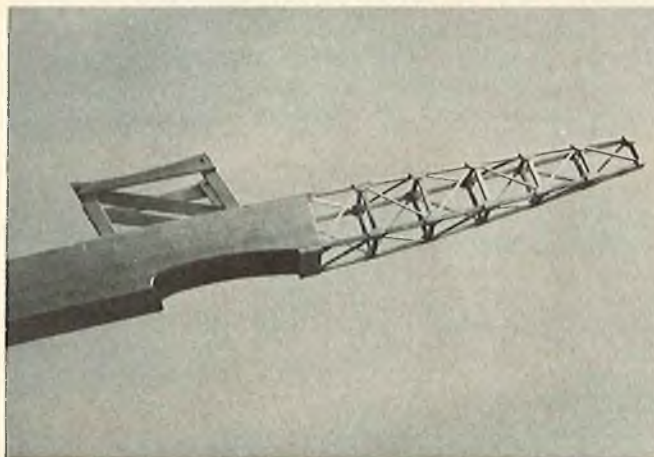
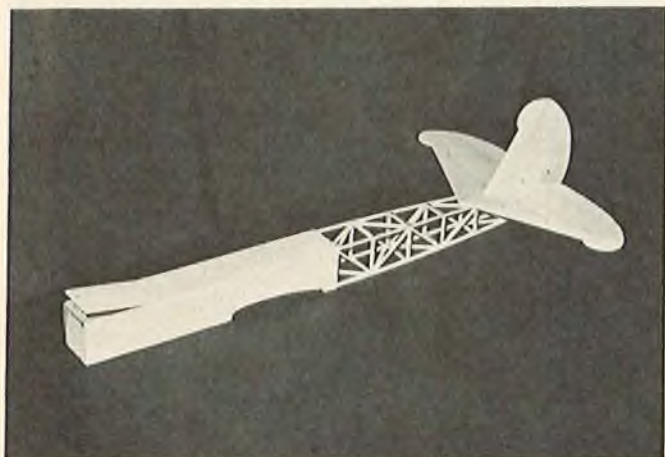
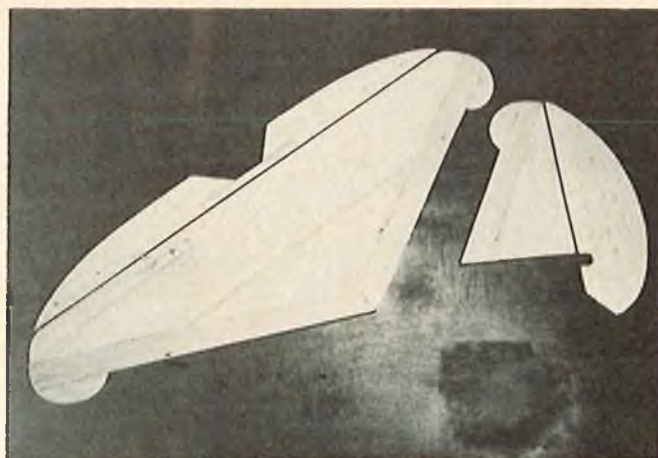
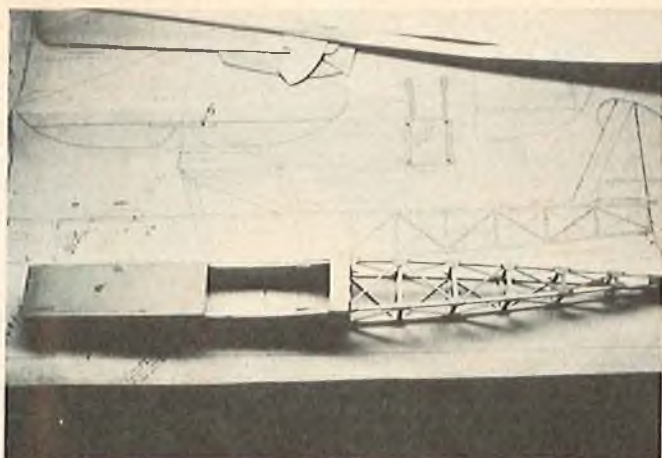
#### WING

The wing is constructed with a unique I-Beam spar (courtesy of Jim Newman) which is unbelievably strong.

With the 3/32" wing ribs, 1/16" balsa (1" & 2") sheeting, 3/32" webbing material, 1/16" x 1/4" cap strips, balsa tips, 1/16" x 1/2" plywood spars, triangular balsa leading edges (l.e.), 1/8" square trailing edge (t.e.), plus 1" tapered t.e. stock, you're ready to start.

Both wings are identical except for movable ailerons on the bottom and I recommend that both the top and bottom wings be built perfectly flat with no dihedral. You can build the right and left panels in one piece on a suitable (straight) building board. (Up to 3° dihedral may be used in the bottom wing but will affect looks more than anything else — and doesn't even help the looks. EarlyBird is stable enough with zero dihe-





**1ST ROW: (L)** Fuselage sides are constructed over plans, one on top of other, then assembled with bulkheads, cross braces, and diagonals over bottom view on plan. Reversing of diagonals on right and left sides, top and bottom, add eye appeal and structural rigidity. **(R)** Stab and fin are constructed of 1/4" balsa. Elevator halves are joined with dowel. **2ND ROW: (L)** Completed fuselage with stab and fin pinned in place. Hatch partially open as if snapping at a mosquito which can run large around the Chesapeake Bay. One M.A.R.K.S. member put 6 oz. of fuel in one before he found it wasn't an aeromodel! **(R)** Fuselage with cabane installed. Dowels hold the assembly together. **3RD ROW: (L)** Wing is built flat (no dihedral) and begins with bottom ply spars laid over plan. Bottom trailing edge sheeting is propped up 1/2", then ribs added from center out (right then left), alternating with 3/32" webbing. Then top spar, 1/8" trailing edge spar and top sheeting is added. This wing is quickly constructed and is incredibly strong. When properly built, it cannot be broken in the air - even on purpose - we tried! **(R)** Here sheeting has begun and ailerons assembled. Ailerons are movable on bottom wing only and may be of the strip variety, made from 1" T.E. stock or conventional. Barn door ailerons look better and are easy to make. They are cut from 1" T.E. stock for curved outboard section which is glued to 1/4" x 1" balsa and hinged to T.E. on bottom wing; glued to top wing T.E. 1" T.E. stock is glued inboard of fixed and movable ailerons on both wings.





**ABOVE, LEFT:** Tail skid looks better than wheel and steers quite as well. Bend from 1/16" diameter music wire and make optional plywood skid from workshop scrap. Add wheel if you like, omitting ply. **ABOVE:** One or more large William Bros. plastic cylinders can be attached to your power plant's crankcase with Velcro to be removed for flying like this one on a K & B .35. It can be further jazzed up with Interplane struts, flying wires and other early aeroplane drag. **EarlyBird** draws a crowd at every flying site – good for the ego. **LEFT:** Close up of wing hold-down. Muffled K & B .40 is on 45° angle. In flight, the **EarlyBird's** maneuverability defies its nostalgic look. Flies like the barnstormers it resembles and can do a respectable pattern, including knife edge. **EarlyBirds** are also being flown as slow pylon racers by some of use whose reflexes aren't quite up to 500 Class racing.

dral even for training. If you feel you must have some dihedral in the bottom wing, cut a plywood dihedral brace to replace the center balsa webbing.)

Place the 1/16" x 1/2" ply bottom spar on your board and shim up the bottom 1" t.e. sheeting (so that the ribs will sit level on the spar) and pin in place. The left and right spars may be butt joined and doubled at the center with the excess cut from the tips to make a one piece wing.

Next, notch the center ribs to go over the center spar doubler and place the center ribs in position, gluing to the bottom ply spar and bottom t.e. sheeting, remembering to leave 1/8" space at the t.e. for the 1/8" square t.e. spar to sit on the bottom 1" sheeting and against the ribs.

Insert 2 pieces of 3/32" x 3" balsa webbing, cut to proper length, and glue (vertical grain) — one to each side of the center ribs. Glue the second rib to the bottom ply spar, bottom t.e. sheet, and to the webbing already in place. Continue until all ribs are installed out to the tips.

Now add the 1/8" square t.e. spar, top t.e. sheeting, center section sheeting, top ply spar, top leading edge sheeting and top cap strips. Allow to dry

thoroughly, then turn over, re-pinning. Add the bottom t.e. sheeting, cap strips, and triangular leading edge (block sanding the ribs and sheeting, if necessary, to insure a good fit. Check the alignment with a ruler, straight-edge, and eyeball. If the leading edge has any twist, or isn't perfectly straight, pin to a straight shim fastened to the building board at the l.e. Absolutely true, perfectly straight flying surfaces are imperative to this (and any) aircraft. Take your time and do it right.

Allow the wing to dry thoroughly and construct the other wing in the same manner.

Now decide whether you want to use strip or conventional ailerons. **EarlyBird's** "barndoor" ailerons are as easy to rig as strip, but the choice is yours.

With strip ailerons, the tapered trailing edge stock is affixed to the t.e. of the wing after construction and actuated on the bottom wing by regular strip aileron hardware following the hardware manufacturer's directions. The top wing strip ailerons are glued in place unless you're going for aerobatic competition in which case you know what to do, right?

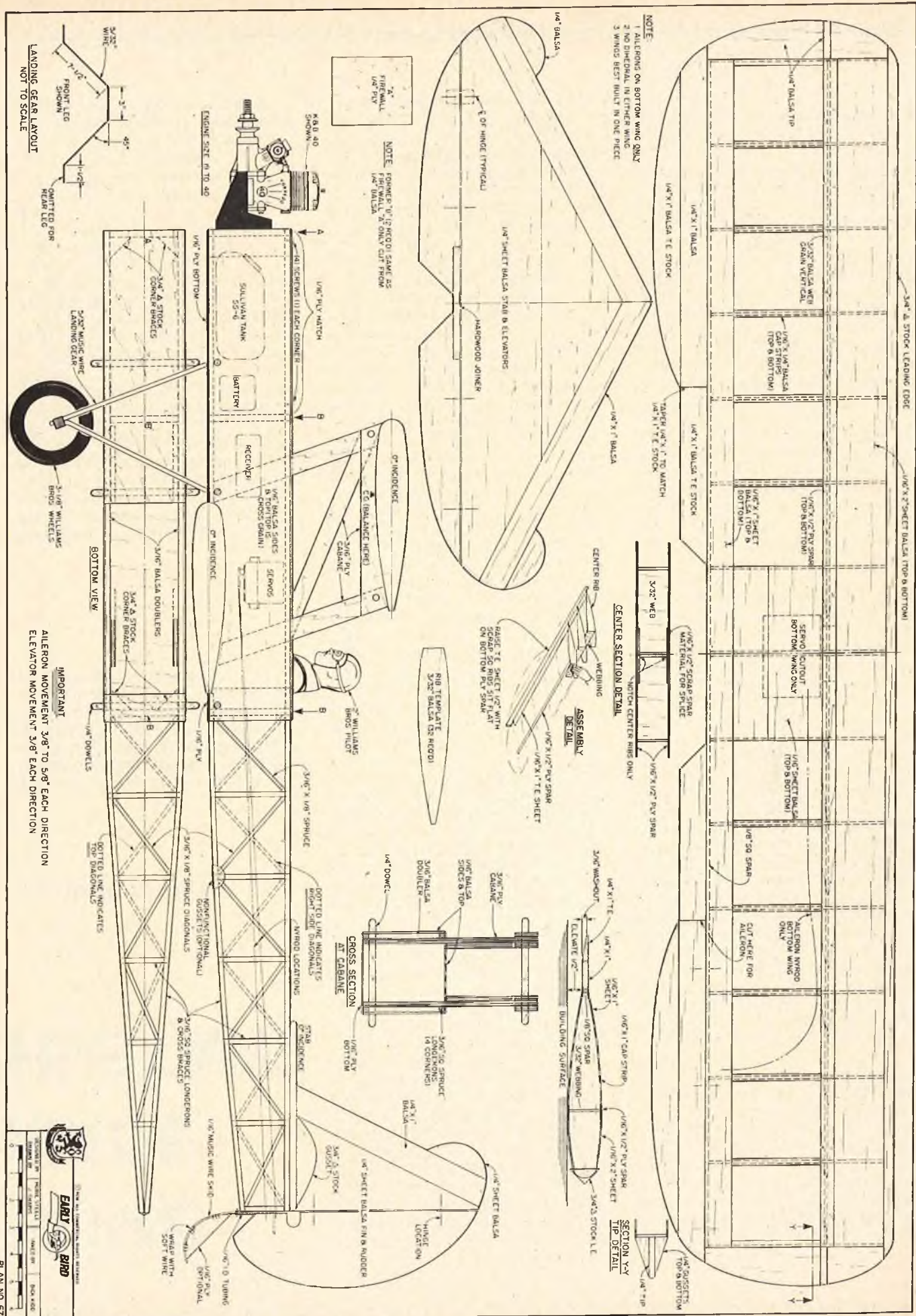
Conventional ailerons require only cutting the tapered t.e. stock as indi-

cated on the plans, then cementing the 1" x 1/4" aileron filler to the short piece of t.e. stock and sanding to shape. Note: 1/8" "up" in fixed and movable ailerons gives washout for great slow speed performance. The longer piece of tapered t.e. stock is glued to the inboard t.e. of the wing, being careful to align it properly so that you don't end up with "flaps".

The bottom wing ailerons are functional while the top ones are simply glued in place after shaping. The bottom ailerons are hinged conventionally and can be actuated by bellcranks or Sullivan flexible pushrods which work really fine. Cut the servo opening in the center section of the bottom wing and add the servo mount to fit your installation. This sounds like I'm passing the buck, but if you're new to RC, an experienced friend should advise you on your control installation and hook-up. There are some good publications for newcomers from RCM's Anthology Library (see ad in this issue) which can make complex problems like control set-up pretty simple if you're a loner. Now, temporarily install the aileron horns.

Check the controls with your transmit-  
to page 118







# HOME MADE HI-START

BY DAVID A. SMITH

*You can make your own sailplane hi-start for substantially less than the cost of a commercial unit. Adapt the length to your own field requirements and this unit will provide you with a launch system that will enable you to fly from virtually any open field.*

● Building a Hi-Start is an easy task with the proper materials and methods. I have found this Hi-Start to be superior to many that are currently on the market. By choosing your own materials, you will cut the cost of buying a ready made Hi-Start by 10 to 15 dollars, plus you will end up with a launch system that will be equal to, or better, than you could have bought.

Let's begin construction by rounding up the following materials:

100' — surgical rubber (heavy or light weight to fit your needs).

150 yds. — 50 lb. monofilament fishing line.

36" — length of 1/4" dowel.

2 — heavy duty snap swivel connectors.

2 — 4-40 x 3/4" machine screws.

2 — 5/16" O.D. flat washers.

2 — 10" metal pie pans.

1 — 1/4" I.D. x 3" brass tubing.

1 — plastic bucket (10" metal pie pan should just fit the top of the bucket).

First, before we begin assembly, a word about surgical rubber. I have found a big difference in the grades and quality of surgical rubber tubing. The red dyed type of surgical rubber seemed to be the best quality of all that I have tried. Hobby Lobby International is the only dealer for this type of rubber that the author has found. This rubber comes in two 50' lengths and must be spliced at the center to obtain a 100' length.

Prepare two end plugs and one splice plug from 1/4" dowel stock as shown. Solder the flat washers into the screwdriver slots on 4-40 machine screws. If necessary, use soldering flux to obtain a good mechanical connection between the washer and the screw. Coat the threads on the screws with 5-minute epoxy and screw them into the holes in the end plugs. Splice the two 50' sections of surgical rubber together by coating the splice plug with contact cement and immediately slide the ends of the rubber tubing on to the plug to meet in the center. The two end plugs are secured to the two ends of the Hi-Start in the same manner.

Tie a snap swivel on each end of the 150 yards of monofilament line, using the knot shown.

A light weight reel to hold your line is made by pop riveting the two pie pans together, bottom side to bottom side. Solder a 2" length of 1/4" I.D. brass tubing through the center of the two pie pans, and solder a 1/2" length of the tubing through the two pie pans 1" from the bottom edge of the pans as shown. A 1/4" bolt 2" long is used to mount the crank as shown in the sketch of the reel. The crank handle can be almost anything from a spool to the top of an old file handle. Mix a batch of 5-minute epoxy and seal the seam between the two pans. This will keep the line from becoming caught in the slot between the reel halves. Drill several 3/16" holes around the edge of one of the pans. Remove any rough burrs from around the holes so that they won't cut the monofilament line when it is wound on the reel. The snap swivels are snapped through the holes to hold the line on the reel.

Now that the reel is constructed, you also have a handy lid for the top of your plastic bucket.

The plastic bucket is used to store and preserve the surgical rubber. The rubber may be coiled into the bucket and left attached to the reel so that the right end will be obvious when removing the rubber. Talc or corn starch may be sprinkled over the rubber in the bucket. This will help to preserve the rubber and keep it

from rotting. Several parachutes are on the market which you could use for your Hi-Start or you might consider constructing one from several articles written on this subject.

I find it very easy to leave my parachute on the same reel as the line --- that way it isn't misplaced and it's always with the line. The parachute should end up wound on the outside of the reel.

To set up your Hi-Start, stake the tow ring to the ground securely with a large screwdriver or metal stake. Pick the most desirable location for launching your sailplane; like next to the ice chest and your favorite lawn chair. Using a Phillips head screwdriver for a handle on the line reel, begin walking into the wind and reel out line as you go. Don't forget the plastic bucket with the rubber. When you reach the end of your line (no pun intended), snap the swivel on to the end of the surgical rubber. Carry the bucket by the handle and allow the rubber to string out of the top. When you have all of the rubber out of the bucket, insert the screwdriver that you used as a handle through the ring in the end of the rubber. Begin walking in the same direction as before and stretch the rubber to the required number of paces before you stake the rubber down. Be sure and push the screwdriver into the ground at an angle so that it won't come loose. Leave the bucket at the rubber tie-down point, that way you'll be able to find it after it begins to get dusk.

After you return to your launching point, you'll be right where you wanted to be. A helpful device to stake your parachute down was shown in a previous issue of RCM and is shown in the accompanying sketches. This handy little device will allow you to make adjustments and pause to refresh before that long awaited thermal flight.

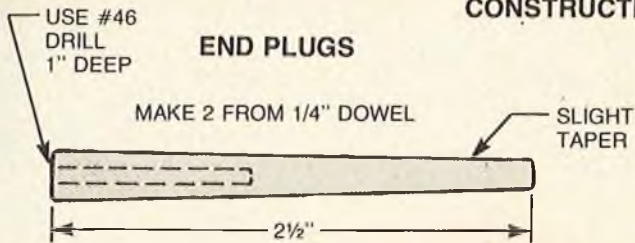
Another idea to help those who fly where there may be a lot of low brush or rocks, is to secure the rubber to a vehicle parked at the tie-down end of the Hi-Start. The rubber should be tied to the vehicle as high as possible. You'll be amazed at how much drag this removes from the Hi-Start, as well as allowing you to retrieve the parachute without snagging low brush and rocks.

One final note on Hi-Starts: When flying on extremely rough surfaces, braided nylon fishing line should be used in place of the monofilament line. The monofilament line is cut very easily by rough surfaces where the braided line will take more punishment under these conditions. □

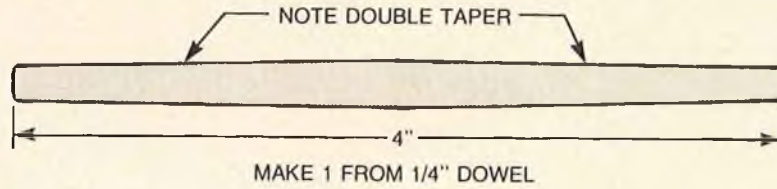


# CONSTRUCTION DIAGRAMS

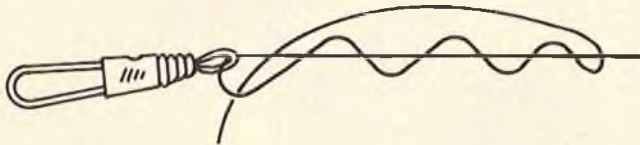
## END PLUGS



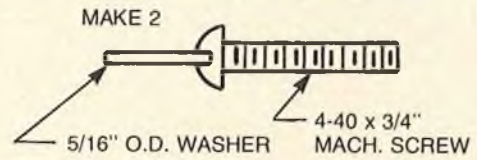
## SPLICE PLUG



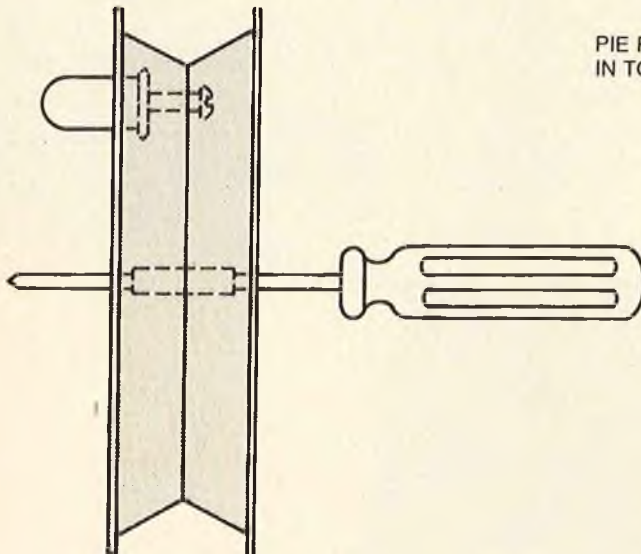
## SNAP SWIVEL KNOT



## HOME-MADE SCREW EYES

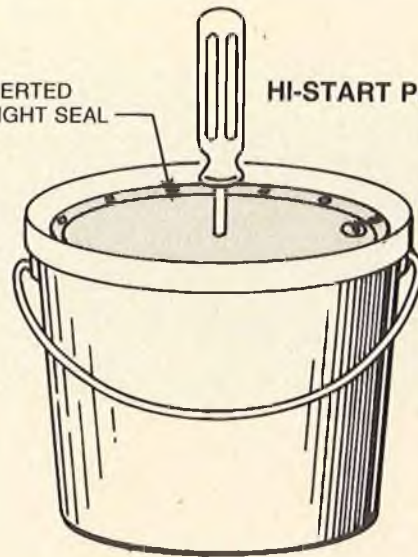


## PIE PAN REEL

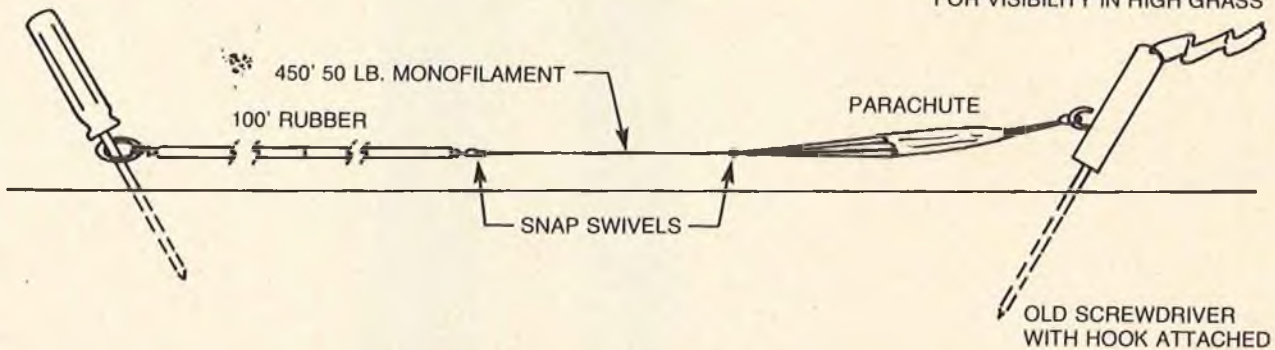


PIE PAN REEL INSERTED  
IN TOP FOR AIR-TIGHT SEAL

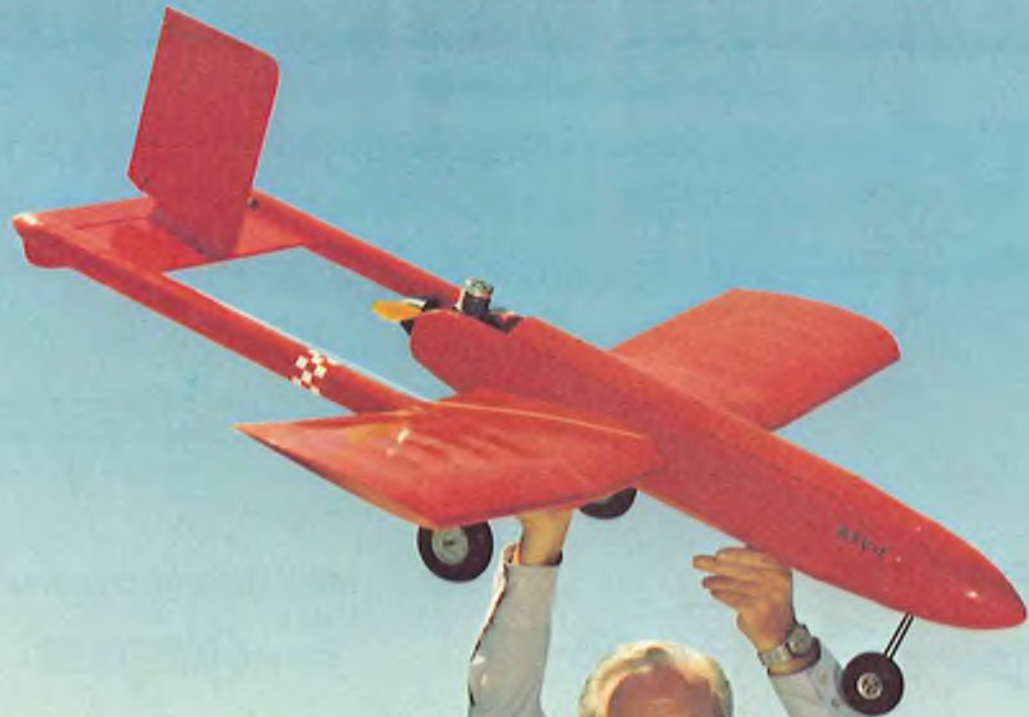
## HI-START PAIL



## COMPLETE HI-START SET-UP











**OPPOSITE PAGE:** One third scale model of Tuboomer built by Duke Crow. **K & B .40, 7 lbs. (3.33 sq. ft. of wing area) for a 2.1 lb./sq. ft. wing loading.** **ABOVE:** Ken Willard holds one third scale Tuboomer. Full scale RPV rests on "Tilt Platform" used for antenna tests.

## Sunday Flier

### KEN WILLARD

● Remote piloted vehicles (RPV's) have long intrigued the military establishment — and other agencies as well — because of their potential ability to perform missions with a minimum risk to the pilot's life. Many designs have been conceived and tested, with varying degrees of success; perhaps the most successful, so far, have been the target drones.

However, the costs involved have always tended to exceed the value of the missions, particularly when the mission, instead of being passive (as in the case of targets), became an active and aggressive support to military objectives. The complexities of remotely operated "scouts" far exceeded the relative simplicity of a target drone's flight path.

Some five or six years ago, Dr. John Foster was Director of Defense Re-

search and Engineering, (DDR&E) for the Department of Defense. At the same time, he and his son were also members of the DCRC (District of Columbia Radio Control) club. Dr. Foster became interested in the potential application of sport R/C equipment as a low-cost, reliable, off-the-shelf control system for RPV's. As DDR&E, he translated this interest into some funded feasibility studies. And, at the same time, several contractors allocated company funds to investigate the same objective.

In that regard, the Lockheed Aircraft Corporation had already been actively using sport R/C equipment in some company studies. For example, in Burbank, California, engineers mounted a small TV camera in the nose of one of my Wavemaster amphibians, and Larry Leonard sat at a console, inside a mobile

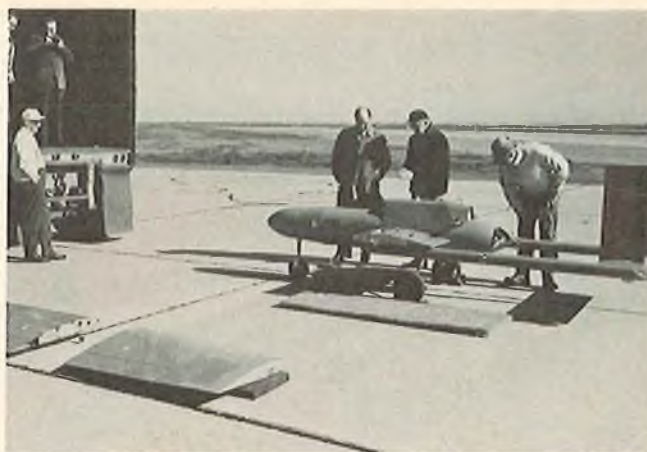
van, and flew the aircraft on simulated attack missions, both air-to-ground and air-to-air. Some of you readers may recall that I published an account of that experiment several years ago.

Since then, many developments have occurred. Sophisticated sensors have been developed and tested; complex missions have been conceived. Much of the activity is, of course, not yet released for public dissemination. But, some of the early development designs, now superseded by more advanced technology, have been cleared for public release. One of them is the Lockheed RTV-1 (Remote Test Vehicle — first version). It was designed to test certain concepts which were under study, in which the total airborne weight of the test vehicle and its payload would be in the 325-350 pound range. Low cost was one





**Unloading the RTV-1 from the truck. The RTV-1 weighs 310 pounds as currently equipped.**



**After unloading, the Lockheed RTV-1 is ready for assembly by the ground support crew.**



**In this photo the crew is assembling the RTV-1 as the wing panels are attached. Emergency vehicle alongside.**



**Ken Willard and RTV-1, ready for flight test. Kraft transmitter modified to 1.7 watts on LMSC industrial frequency.**



**Ken Willard taxis the RTV-1 out for take-off.**



**The RTV-1 Tuboomer takes to the air on its first flight.**

of the objectives, so off-the-shelf components were used wherever possible.

The photographs show the basic design — twin boom pusher, which leaves the nose compartment available for various payloads. It was inevitable that the bird was nicknamed the "Tuboomer."

While the big bird was being built and checked out, a 1/4 scale, and then a 1/3 scale version, were built and test flown.

That flight training was very valuable in providing control response and flight orientation experience — and the same control box, a Kraft single stick transmitter, was used on all three aircraft.

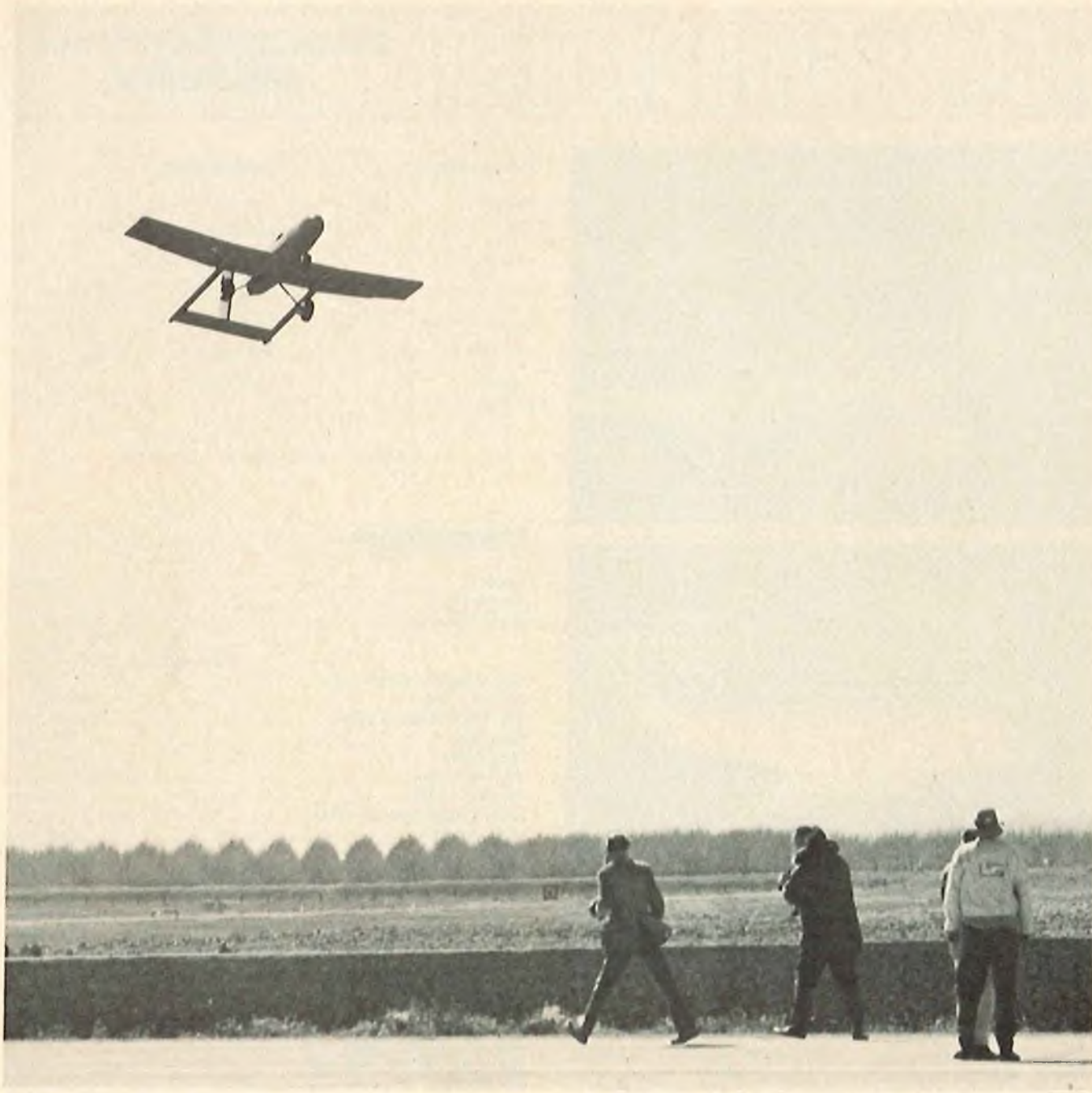
Different servos were used on the full scale version. Obviously, even the largest Kraft servos couldn't handle a 325 pound airplane. So, another off-the-shelf servo was adapted, in this case

the mechanism used to raise and lower the headlight shrouds on Chevrolet Corvettes — worked fine.

Engine? A modified snowmobile powerplant. Low cost, yes; but it did vibrate more than we liked. So, a mount was designed to reduce it to an acceptable level.

A fairly standard control set-up was used. Since no aerobatics were in-





**The Tuboomer circles overhead, slowly gaining altitude. Pilot Ken Willard in lower right corner of photo (note antenna). Bob Andris, spotter and back-up pilot, stands behind Ken and calls out aircraft altitude (right turn, left turn, climb, dive, etc.) during flight. RTV-1 came to rest on apron at the end of this flight following a "dead stick" landing after engine quit in mid-air.**

tended, coupled aileron and rudder action was installed. Brakes operated on the main gear only, and were actuated by pushing down elevator. Just like sport R/C.

With 325 pounds, and 30 square feet of wing area, the wing loading was almost 11 pounds per square foot — considerably higher than the common R/C loadings of 1 to 2 pounds or so per square foot. The power loading was also higher — around 13 pounds per horsepower. It was readily apparent that the Tuboomer would not, to say the least, be a high performance airplane. It wasn't — nor was it intended to be. A good, stable, and easily controlled test bed was the

objective.

The Tuboomer was successfully test flown early in 1973. The photographs tell the story best — Crow's Landing, a Navy operated airport near Patterson, California, provided a perfect test site — long runways surrounded by open fields.

The flight achieved the test objectives, but wasn't without incident. Just prior to turning from the base to final leg in the landing pattern, the engine quit. A successful "dead stick" landing was accomplished, but I was very thankful for the hours of practice I had put in on the R/C scale models.

Sport R/C equipment made the day, and sport type R/C flying practice saved

it.

So, even though the systems are far more sophisticated now, you can rest assured that your hobby and sport of radio control flying has played a significant part in the development phases of remote piloted vehicles and their missions.

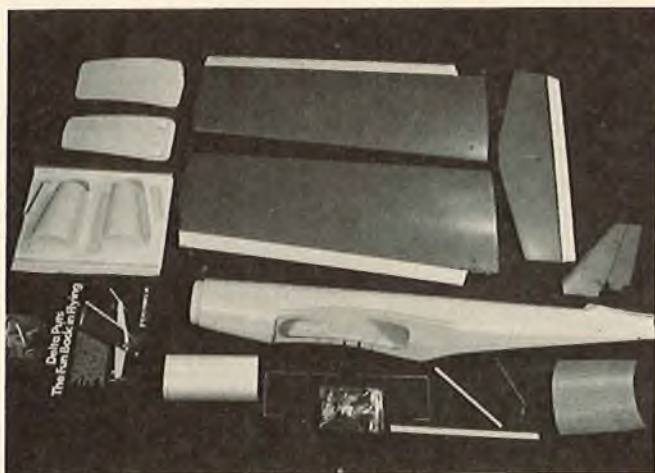
And is continuing to do so.

*(Ed. note: This column was written by RCM's Chief Sunday Flier at the U.S. Army's Yuma Proving Ground, where he is participating in flight tests of a much more sophisticated RPV. We hope to have that story later on in 1977.)* □



# RCM PRODUCT TEST

**DELTA PRODUCTS, INC.  
DELTHON**



● The Delthon is a sport type aircraft manufactured by Delta Products Inc., P.O. Box 1147, Grand Junction, Colorado 81501. With a suggested retail price of \$89.50, this high performance sport aircraft has a wing span of 47" and a total wing area of 430 square inches and utilizes a laminar flow airfoil. Designed for .29 to .40 cubic inch displacement engines, four channels of control are required. The kit is unusual in the fact that it has a molded laminar flow, vinyl covered wing and vinyl covered stab with all control surfaces hinged, a vacuum formed ABS fuselage with firewall installed, and brass rod included for the pushrods. Control horns, screws, and the brass pushrods are included in the kit and only the tank, wheels, radio and engine are necessary to complete the Delthon. Spare parts are readily available for this aircraft.

The weight of RCM's prototype, ready to fly, was 68 ounces for a wing loading of 22.8 ounces per square foot. The Profi .21 engine with Profi muffler was used for power while an MRC 5 channel radio was used for guidance.

With regard to the kit, the engineering was well thought out and all materials were excellent. In the flight performance department, the Delthon was controllable at all speeds and was very quick and precise. The wide spaced main gear makes ground looping somewhat of a problem which can be cured by slightly toeing-in the wheels. No modifications are necessary or recommended for this aircraft. □

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts		●			
Plans			NA			Parts Match to Plans		●			
Written Instructions	●					Overall Parts Fit		●			
Quality of Hardwood			NA			Ease of Assembly		●			
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials	●					Flight Performance			●		
Accessories	●					Overall Appeal			●		
Die-Cutting			NA								

E = Excellent / G = Good / A = Average / F = Fair / P = Poor

## SPECIFICATIONS

Name ..... Delthon  
Aircraft Type ..... Sport  
Manufactured By ..... Delta Products, Inc.  
P.O. Box 1147  
Grand Junction, Colorado 81501

Mfg. Suggested Retail Price ..... \$89.50  
Available From ..... Manufacturer  
Mfg. Recommended Usage ..... General Sport  
Wing Span ..... 47 Inches  
Wing Chord ..... 9.1 Inches (Avg.)  
Total Wing Area ..... 430 Square Inches  
Fuselage Length ..... Not Given  
Radio Compartment Dimensions ..... (L) 11" x (W) 2 3/4" x (H) 3"  
Wing Location ..... Low Wing  
Airfoil ..... Symmetrical  
Wing Planform ..... Not Given  
Dihedral ..... 4 Degrees  
Stabilizer Span ..... 18 1/2 Inches  
Stabilizer Chord (incl. elev.) ..... 5 Inches  
Total Stab Area ..... 92.5 Square Inches  
Stab Airfoil Section ..... Flat  
Stabilizer Location ..... Top of Fuselage  
Vertical Fin Height ..... 6 1/2 Inches  
Vertical Fin Width (incl. rud.) ..... 4 Inches  
Mfg. Rec. Engine Range ..... .29-.40  
Recommended Fuel Tank Size ..... 8 Oz.  
Landing Gear ..... Conventional  
Recommended No. Of Channels ..... 4  
Recommended Control Functions ..... Rud., Elev. Throt., Ail.

### Basic Materials Used In Construction:

Fuselage ..... Plastic  
Wing ..... Foam w/Vinyl Finish  
Tail Surfaces ..... Not Given  
Hardware Included In Kit ..... All that is necessary to complete  
Plan Size ..... NA  
Building Instructions on Plan Sheets ..... NA  
Instruction Manual ..... Yes (15 pages)  
Construction Photos ..... Yes  
Kit Includes ..... Shaped Parts  
Mfg. Rec. Flying Weight ..... 64 Ounces  
Wing loading based on rec. flying wt. .... 21.5 oz./sq. ft.

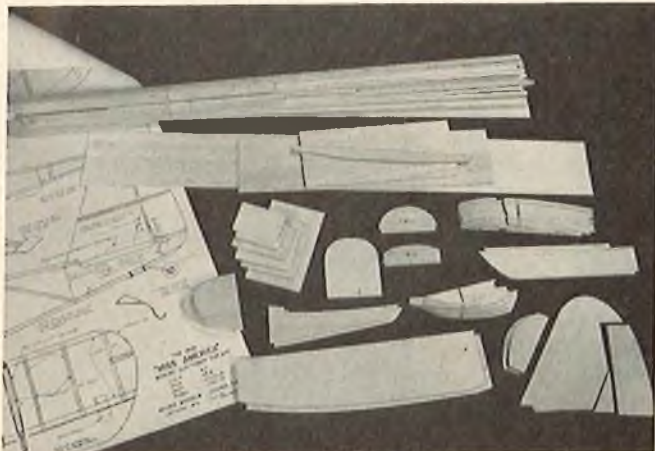
## RCM PROTOTYPE

Weight, Ready To Fly ..... 68 Ounces  
Wing Loading ..... 22.8 oz./sq. ft.  
Covering & finishing materials used ..... ARF  
Engine Make & Disp. .... Profi .21  
Muffler Used ..... Profi  
Radio Used ..... MRC 5 Channel  
Tank Size Used ..... 8 Ounce



# RCM PRODUCT TEST

## MICRO MODELS MISS AMERICA



IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts		●			
Plans	●					Parts Match to Plans		●			
Written Instructions	●					Overall Parts Fit		●			
Quality of Hardwood		●				Ease of Assembly		●			
Quality of Fiberglass			NA			Fidelity to Scale	●				
Other Materials					●	Flight Performance	●				
Accessories			NA			Overall Appeal	●				
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

## SPECIFICATIONS

Name ..... Miss America  
 Aircraft Type ..... Old Timer  
 Manufactured By ..... Micro Models  
 P.O. Box 1273  
 Covina, California 91722

Mfg. Suggested Retail Price ..... \$27.95  
 Available From ..... Both Mfg. and Retail Outlets  
 Mfg. Recommended Usage ..... Sport & Competition  
 Wing Span ..... 48 Inches  
 Wing Chord ..... 7 Inches  
 Total Wing Area ..... 310 Square Inches  
 Fuselage Length ..... 31 Inches  
 Radio Compartment Dimensions ..... (L) 7" x (W) 2½" x (H) 3"  
 Wing Location ..... High Wing  
 Airfoil ..... Flat Bottom  
 Wing Planform ..... Constant Chord  
 Dihedral ..... 1¼ Inch  
 Stabilizer Span ..... 17 Inches  
 Stabilizer Chord (Incl. elev.) ..... 5 Inches  
 Total Stab Area ..... 85 Square Inches  
 Stab Airfoil Section ..... Symmetrical  
 Stabilizer Location ..... Top of Fuselage  
 Vertical Fin Height ..... 5 Inches  
 Vertical Fin Width (Incl. rud.) ..... 5¼ Inches  
 Mfg. Rec. Engine Range ..... .09-.15  
 Recommended Fuel Tank Size ..... 2 Oz.  
 Landing Gear ..... Conventional  
 Recommended No. Of Channels ..... 1, 2 or 3  
 Recommended Control Functions ..... Rud., Elev., Throt.  
 Basic Materials Used In Construction:

Fuselage ..... Balsa, Ply & Mahogany  
 Wing ..... Hardwood, Ply & Balsa  
 Tail Surfaces ..... Balsa  
 Hardware Included In Kit ..... Very Complete  
 Plan Size ..... 24" x 36" (1 sheet)  
 Building Instructions on Plan Sheets ..... Yes  
 Instruction Manual ..... Yes (5 pages)  
 Construction Photos ..... Yes  
 Kit Includes ..... Shaped Parts  
 Mfg. Rec. Flying Weight ..... 30 Oz. (3 ch.)  
 Wing loading based on rec. flying wt. .... 13.9 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly ..... 34 Ounces  
 Wing Loading ..... 15.8 oz./sq. ft.  
 Covering & finishing materials used ..... Solarfilm & MonoKote  
 Engine Make & Disp. .... Enya .15  
 Muffler Used ..... Enya  
 Radio Used ..... Citizenship  
 Tank Size Used ..... 4 Ounce

● Manufactured by Micro Models, P.O. Box 1273, Covina, California 91722, the Miss America is an old timer kit designed by Stan Blumberg. Priced at \$27.95, the Miss America qualifies for SAM competition and has a wing span of 48 inches with a total wing area of 310 square inches. A high wing miniaturized design of the famous Miss America free-flight, the Micro Models version is designed for .09 to .15 cubic inch displacement engines. The recommended number of channels is 1 to 3 operating rudder, elevator and throttle.

Materials used in the construction of the Miss America are conventional balsa, plywood and hardwood, while the hardware in the kit includes the landing gear and tail wheel wire. In addition, the kit has special extra instructions for a built up empennage in case the flyer does plan to use the plane in SAM competition. There is one plan sheet measuring 24" x 36" with building instructions included on the plan sheet, in addition to a 5 page instruction manual. Another unusual feature is a list of accessories, needed to complete the Miss America, included on the outside of the kit box — an excellent shopping list.

RCM'S prototype of the Miss America weighed 34 ounces ready to fly for a wing loading of 15.8 ounces per square foot. Our model was finished with white Solarfilm while the stars are red and blue trim MonoKote with the side stripes also of red trim MonoKote. An Enya .15 engine and muffler was used for power while a Citizenship radio provided the control.

With regards to modifications to the kit, we replaced the mahogany plywood landing gear and main dihedral brace, which were broken in our kit, with aviation plywood. We used 3 degrees down thrust for the .15 which proves to be exactly correct. We also added a 3/32" doubler in the bottom of the battery and receiver compartment. Structurally, the wing is, for its size, the strongest we have ever seen in a model aircraft. The entire plane is built for rough handling and would be excellent for a novice flyer. It is extremely easy to build and all

to page 118



# Power Boating

DAVID THOMAS



**Supercycle - - - a must for the serious boater.**

● For some time now I have been using a most interesting piece of equipment, sent to me by Electrostar Systems. This is the Supercycle, and I can honestly say that I don't regret for a moment having this item around. Quite briefly, it is a charger with a discharging system built into it. So that's nothing new!

Well, yes it is, because this one has a pair of clocks, which time the discharge period. By calculation, knowing the average time you use your RC gear during a boating or flying session you can work out quite accurately how long you could have gone on if you hadn't had to pack up, in order to get back before your wife locked you out!

But there is more; by using the discharge facility, you can prevent the batteries from developing memory, and so extend their useful working time. Finally, by recycling an old pack several times, you can sometimes bring it back to a state where it can be used.

Above all, I have found that the Supercycle has given me something I never had before — a pretty exact idea of just how much longer I can go on, before having to change batteries. This instills a lot of confidence. In the boating field, it is particularly good when you are running long endurance races. Of course, for the fly-boys, its value is inestimable, since, if you figure the cost of building, it's much better to invest in a Supercycle than to build a new plane, not to mention maybe damaging the engine, and/or the radio gear. But whatever sort of radio model you have, this piece of equipment will not be out of place in your workshop. I can recommend it. The producer is: Electrostar Systems Inc., 116 Toledo St., Farmingdale New York, 11735.

★

Last time I said we would take a look at radio installations in boats, so let's go ahead and do that. But first of all we have to consider the criteria. The very first thing to keep in mind is that the installation has to be completely waterproof.

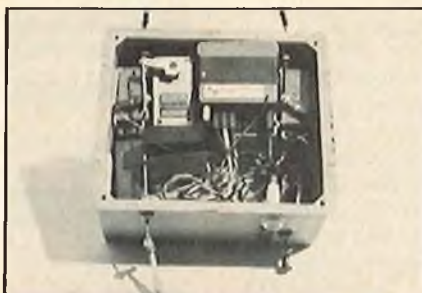


**Angles for locating radio box, molded in resin and micro-balloons. Note rudder and greasing tubes.**

This is even more true if you are going to run the model in salt water — it is just like acid where radio gear is concerned! The second requirement is that, just like a plane, the gear has to be protected from vibration. A lot of people tend to ignore this, but don't you do it! Remember, a boat hull can resonate as much as, if not more than, a plane fuselage. Third, you have to decide whether you need to move the gear from one boat to another. This last item used to be pretty tricky, but with miniature modern gear it presents very little in the way of problems. Okay, with these three in mind, let's go.

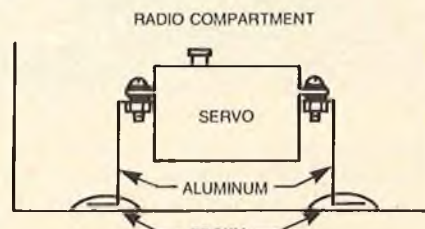
The great majority of modelers built a water-tight compartment into the boat, and fit the radio gear inside this. There is no great difficulty in constructing such a compartment, but there can be a problem over sealing it. I have found that the easiest way to do this is to surround the opening with a strip of foam rubber (not plastic foam!) and then screw a perspex hatch down tightly onto it. This is not only waterproof, it also allows you to check that the radio is working, without opening the compartment. The photo will give you an idea of the set-up. There is really not much that can be said about building this compartment, except that a good

**Movable, watertight radio box by Racing Models, England, containing receiver, servos, battery pack, switch, antenna jack, charging sockets, plus a fail-safe system which goes to slow motor and right rudder.**

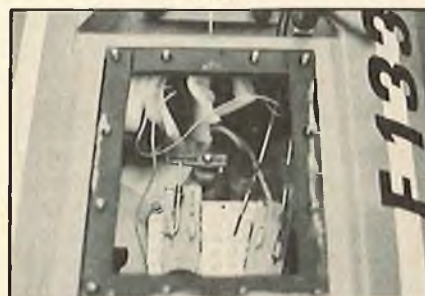


idea is to paint the entire inside of it, once it is finished, with a layer of white polyester resin. White, because this makes it a lot easier to see what is going on in there. The hatch does not have to be perspex, it can be a thick piece of aluminum, or glassfibre, or even waterproofed plywood.

If you have only one boat, and you don't intend to use the radio gear in anything else, then you can very well install it in pretty much the same way as you would in a plane, on servo trays. The easiest way to do this is to cut the trays out of a piece of thin aluminum sheet. But make sure you cut them so that the servo is not touching the floor of the hull. The reason is simple — however well you build that compartment, there is always the risk of a few drops of water getting in, and swilling around in the bottom of it. If you keep them above the floor, the water shouldn't get at them. See Figure 1.



**FIGURE 1  
ALUMINUM MOUNTING PLATES  
FOR SERVOS**



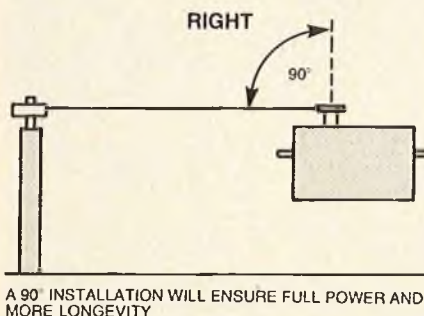
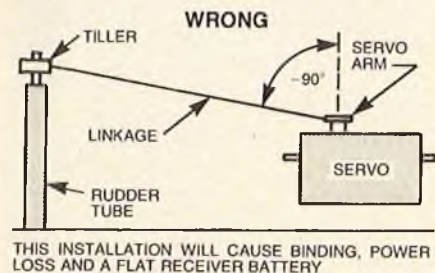
**Typical radio installation showing servos mounted on a plate above the level of the hull.**

The receiver and the battery should be mounted in the same way, but in order to protect the receiver, stick it onto the mount with some thick, double-sided servo mounting tape. This will stop it moving around, and damp out the vibrations. You can do the same thing with the battery.

There is one point to which particular attention should be paid, and this is to make sure that the servo arm and the control horn it is actuating are on the same level. If they are not level, then you



will get binding, which is hard on the servo, and which will flatten the receiver battery, and cause you trouble. So take the time to get it right. See Figure 2.



**FIGURE 2  
RUDDER SERVO LINKAGE**

Personally I have more than one boat (eleven at the last count, with three more building!) and not being a millionaire, I have to be able to change the radio from one to another. And I have to do it easily and quickly, otherwise it becomes a chore. And the answer to this is, quite simply, a waterproof box. Now a lot of you will immediately start thinking "Aha, a plastic sandwich box — we know all about that!" Well, think again because while the plastic sandwich box is a way of doing it, it is not a very good one. No, I am thinking of a more specialized set-up, where the receiver, servos, switch and battery are all in the same unit, and that unit is 100 percent waterproof.

About five years ago I built my own box, by moulding it inside a Tupperware container I pinched — temporarily — from the kitchen. (Unfortunately my wife found out, and I got into nearly as much trouble as over the hairdryer episode. What was that? Well, I wanted to dry a polyester resin hull in a mould, in a hurry. So, I borrowed my wife's hairdryer, made a tent of polyethylene sheet, and put the mould in the dryer inside it. But then I got called to the phone, and after that I decided to have a cup of tea, and . . . well, you know how it goes. When I got back to the workshop, I found a fused lump of plastic and metal, spitting sparks all over the place — just before all the lights went out! Oh boy, was I popular. Even the dog ignored me for a couple of days! Actually, it was quite a dangerous trick, and I wouldn't advise anyone to use it. If you do want to dry a mould fast, then get hold of a big

cardboard box, much bigger than the hull in question. At one end, inside, fit a light socket, with a 100 watt bulb, but make sure that the bulb is well-supported, so it can't touch anything. Make a few holes in the lid, one in each corner at the bottom; put the mould inside, and switch on. If you want to get really clever, line the inside with aluminum cooking foil — this cuts the fire risk even more. But whatever you do, don't leave the box unattended with the light on.)

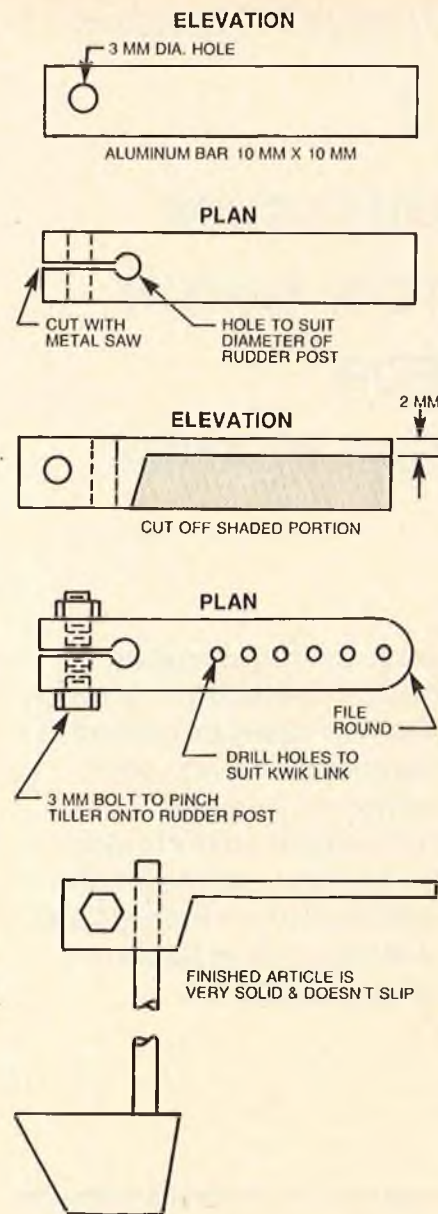
Right, where was I? Oh yes, I made a box, and around the edge I poured some liquid rubber to make a seal. The servos, were rotary output, because this is not very practical with the linear type, were bolted to the lid so that the arms were outside the box. In this case the battery was not inside, because it had to be small, to be used in a couple of small steering boats. I still have this box, and I still use it, as you can see in the photo.



*Rather untidy home-built radio box.*

However, there is now a radio box on the English market, and this is the ideal thing, since it was designed by John Stidwill, twice World Endurance Racing Champion. He makes a whole range of boating gear, including the really fabulous Jaguar hulls. I use his products exclusively for endurance racing, and the only complaint I have is that he spends so much time thinking up something better that by the time I have built a model, it is already out of date. You can see from the photo that this is bigger than my original box, and much more sophisticated. The servos are mounted completely inside the box, and the lead-outs pass through drilled bolts, which are held in rubber grommets. This means that if you are using a rotary servo, the grommet will allow some angular displacement of the rod, without binding. The box comes complete with grommets, bolts, aerial and charging plugs and sockets, and all the other accessories.

I spent some time puzzling over how to mount the servos, but, in the end, decided that the simplest solution was to use servo tape for everything, except the switch which is mounted with a couple of bolts through the bottom of the box, and, sealed with liquid rubber. The cover is a clear plastic, with reinforcing which is screwed down onto a rubber seal. The



**FIGURE 3  
TILLER ARM**

same guy makes the only flexible coupling my old Rossi can't break, and he trades under the name of Racing Models, 3 High St., Teddington, Middx., England. Don't hesitate to write to him, he is one nice guy, and nothing seems to be too much trouble for him.

The next thing is to decide how to fix the box in the hull. Well, nothing could be easier. First of all mark out exactly where you want the box to go. Now oil the four bottom corners of the box with some 3-in-one. Mix up some resin and micro-balloons, and put a big glop on the floor of the hull, where the corners of the box will rest. Press the box down onto them, build the resin up a bit around the sides, and leave to set. When the resin has polymerized, pull the box out gently, and then trim the resin with a sharp knife or a wood chisel, make it look tidy. Then on each side of the box emplacement, glass a hook onto the hull floor. And

to page 112



## MINIATURE TOW WINCH FOR SAILPLANES

**A completely portable, miniature electric tow winch that can easily be carried to the field along with your sailplane. A unique turnaround pulley is also included as well as detailed information on the care and maintenance of lead acid storage batteries.**

---

### ABOUT THE AUTHOR

The author is 28 years old and has been in modeling for about 10 months after having left the hobby about 15 years ago (back in the dark ages of single channel non-proportional radio systems). As a purist/perfectionist, his main modeling interest is in sailplanes where the skill required to keep a model aloft in invisible areas of rising air never fails to challenge him. He has built numerous custom designed sailplanes, his most recent design which is designed for extremely low drag (1" wide fuselage, 1/8" thick stabilizer surfaces), great rigidity (geodetic construction), light weight (44 ounces for 1120 square inch wing area = 5.7 oz./ft.<sup>2</sup> wing loading), but with wide speed range and landing control offered by full length flaperons with 100 degree motion making vertical dives at terminal velocity possible without wing flutter. The 25% variable camber 9% thickness wing offers truly outstanding light air performance. His other interests include custom designed and built stereo components including electrostatic speakers, associated electronics, live recording, and publishing construction articles on these projects. Additional interests include photography, wind generators, and electric cars. He is a Family Nurse Practitioner by profession.

---



*Complete portability of the miniature tow winch is evident in this photo.*

● As an avid sailplane enthusiast, I find myself flying a great deal. Besides flying weekends, I often come home from work and go out and fly for a couple of hours in the evening. Launching has been a bit of a problem because we are not allowed to take out cars onto the field of our local high school. This requires that we carry our winch onto the field. Besides the fact that we have to cross a canal, we may have to set up anywhere from 100 to 500 yards from our cars. Our winches weigh about forty pounds and the batteries weigh about sixty pounds. Needless to say, it is not exactly convenient to haul a hundred pounds for a distance of 500 yards. Furthermore, it requires that several trips be made since the winch must be taken in sections and there is the glider, radio, and inevitable box of "junk" that must also be taken onto the field.

Other things were tried for launching such as gas and electric motors on the glider (even to dropping the batteries that drove the electric motor by parachute by radio command) and the old standby, the "hi-start". None of these methods are nearly as good as winch launching. None gives as tight control of the launch, is as consistent or reliable, and only the winch will allow practice as though one were at a contest. Clearly, it seemed that it must be possible to make a smaller winch!

I thought about the problem for some time, and found that the biggest problem

was that I was unable to determine exactly how much power was required to tow a glider adequately. Just how many pounds of tension is required on a tow-line? How fast does it have to travel? One thing was clear: Under no conditions could the winch allow a large glider to stall on tow. Without adequate figures relating to tension and speed, it was not possible to calculate the torque and rpm for a given winch drum and, therefore, it was not possible to determine how much power was required for the powerplant. Measuring a conventional winch is worthless because, as one attempts to stall these large series wound motors, the thing becomes essentially a bottomless pit of torque which breaks all tow-lines and scales. Moreover, it would really have to be measured at the rpm it usually operates at under actual operating conditions. As I do not have a tachometer or dynamometer, I was unable to accomplish these tests. Therefore, a winch was designed by "educated guess", trial and error, and a healthy dose of good luck.

The winch described is a refined version of the original and has been completely "debugged" and proven in several months of use and thousands of launches. The unit weighs only 32 pounds *including battery*! It is packaged as a total unit, ready to operate, and is only 10" x 12" x 10" in size. It launches large gliders (our largest is 12 feet, the



heaviest is slightly over four pounds). The unit is very similar in performance to a typical "6 volt winch", although it may be just a bit "faster". It has enough power to break 75 pound test towline. The most noticeable difference between this winch and the usual "6 volt winch" is that it makes a very different sound . . . it really winds up! The motor turns several thousand rpm unlike a car starter typically used.

I had quite a problem finding a suitable power plant. I had felt that perhaps an electric trolling motor used on boats might do but, after writing for some specifications, determined that it would be inadequate, I felt that at least 1/2 horsepower would be required (about 400 watts or better). I finally settled on a starter motor from a Honda 750 motorcycle. These motors are rated at .65 KW (650 watts — one HP is about 750 watts). I was dismayed to find that these things cost about \$85.00 new, and outboard motor starters are no cheaper. So off to the junkyards. They aren't easy to find there either! I did find one that wouldn't work at a motorcycle salvage yard and purchased it for \$5.00. A careful inspection revealed that oil had gotten on the commutator, along with some grime, and that after a good cleaning, the motor looked and operated like new. The motor operated at a very high speed and did not have adequate torque to drive a winch drum directly. Therefore, a reduction drive is required. Although a roller chain is highly efficient and readily available, the servicing they require and the thought of a winch line caught in a sprocket turned me off this idea. A synchronous belt drive was chosen instead. A ratio of 2.57:1 was selected with a 2" winch drum hub diameter to give, what I thought would be, a suitable speed and torque (as luck would have it I was exactly correct, the ratios have never been changed as they work perfectly). A careful study of the *Handbook of Synchronous Drive Components* revealed that a 3/8" wide nylon covered fiber reinforced neoprene drive belt with 1/5" pitch, should be able to handle the power transmission. The belt and suitable pulleys are available from: Stock Drive Products, 55 South Denton Avenue, New Hyde Park, New York 11040. Their stock number for the belt is 6R3-100-037. This is a 100 tooth belt and will allow adequate clearance for the motor and 6" flanges on the winch drum. The cost is \$2.03. The motor pulley is double flanged, made of 6061-T6 Aluminum Alloy and anodized (Do not use Delrin or other plastics for this application!). Its stock number is 6A3-28DF03710. It has 28 grooves and costs \$2.75. Actually, I used sintered steel in my pulley and if you prefer, its number is 6F3-28DF037. It costs \$2.61. I think the savings in weight makes the aluminum a good choice however. It is also easier to machine. The larger pulley is 6N3-

72NF037, has 72 teeth, is aluminum, and costs \$5.81. Prices are probably no longer current. SDP will not ship C.O.D. and I suggest prepayment. Otherwise they will send you a letter telling you how much money to send. Include a bit extra for postage.

A 12 volt battery is required for the system. I originally used a Honda 750 battery, but found that with 3 fliers practicing 2-Minute Precision landings, that we could run it down in about 2 hours. The present winch uses a battery found in garden tractors and is readily available from Sears for around \$30.00. We have never run it down. It will certainly fly three or four fliers all day if anybody is thermalling. It has about 2½ times the capacity of the motorcycle battery. The weight penalty is about 11 pounds however, and you may wish to use the motorcycle battery if you plan to need no more than 20 launches or so in a given flying session. Yet another alternative is to use your car battery if you can drive to the launch site. You will need only make up the drive unit and use jumper cables from your battery to run the unit. The winch is fairly efficient and you should not find it possible to run down your car battery even if flying constantly up and down all day. Remember, however, that this is equivalent to the typical 6 volt winch, even though it is operated on 12 volts.

Construction is, unfortunately, some-

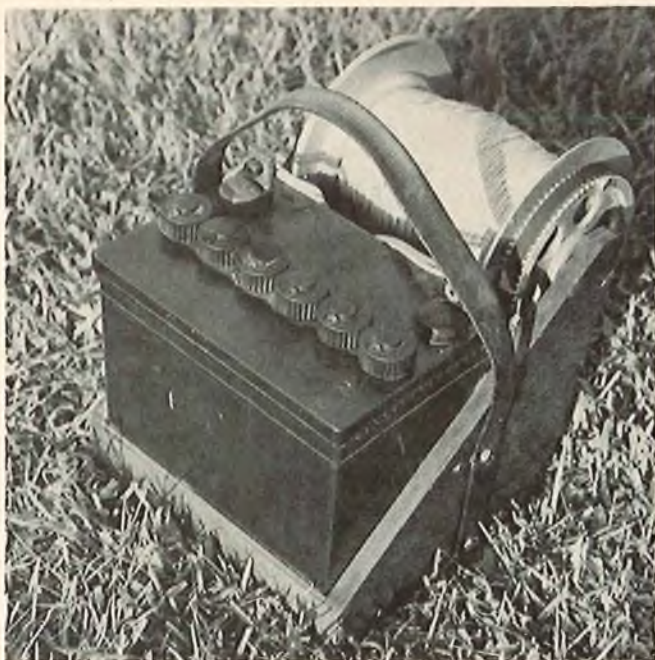
what of a problem unless you have access to a metal lathe. I would not recommend this project for anyone who has not had some experience in mechanical construction projects. You may have to improvise some of the construction as the parts you get may be somewhat different than mine; i.e., different motor, different bearings. The plans are self-explanatory to anyone with some experience in mechanical construction. Some comments are in order, however. The motor pulley must be bored out on a lathe to accept the motor shaft. The motor shaft is splined and, therefore, somewhat troublesome on which to mount a pulley. The shaft is extremely hard, so cutting off the splines is out of the question and I didn't have a tool post grinder, so I chose to mount the pulley with a press fit rather than with its Allen set screws. The splines taper slightly, so if the pulley is bored it will just slide over the end of the shaft and will become tight when pressed well onto the shaft. Check your shaft with some calipers before doing this, however. Pressing the pulley on this way, aligns the unit well and it runs true. Do the basic pressing with the tailstock of the lathe while the pulley is still mounted in the lathe chuck.

The major part of the winch is the drum itself. I made a drum up with a redwood hub and plexiglas flanges. Apparently, the compression forces on the drum are incredible because it soon

**View of completed miniature tow winch.**



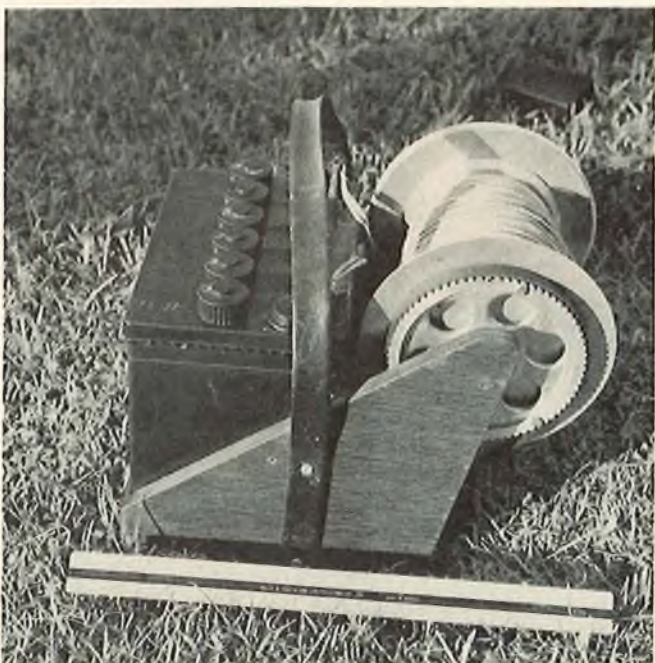




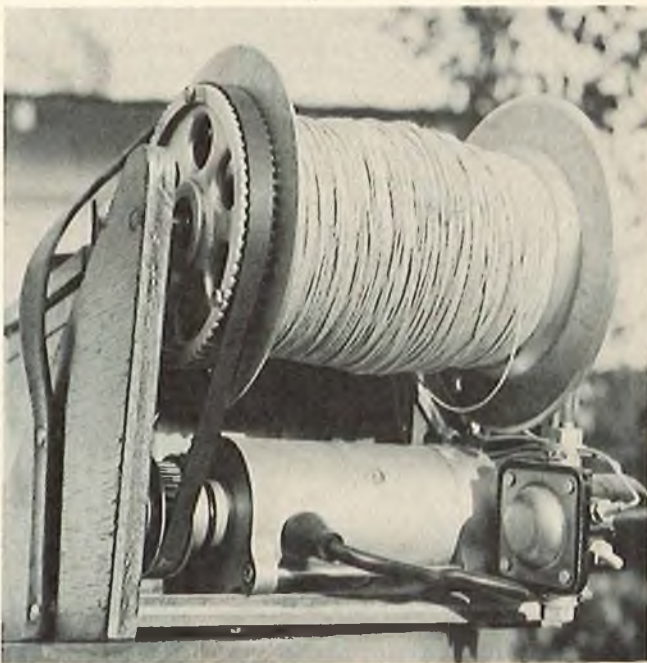
*View of the sailplane tow winch showing battery position. Note leather carrying strap.*



*View of the tow winch from the drum side. Battery is a Sears garden tractor unit.*



*Note side view profile of tow winch. Overall size is 10" x 12" x 10".*



*This front view of the winch shows the motor and drive train described in text.*

crushed under the force of the line. I then made one up out of 2" aluminum bar stock and aluminum flanges, 1/2" thick set into the aluminum bar stock with 1/4" Allen set screws. Would you believe that the force of the line actually squeezed the flanges right off the end of the bar? Grooves 1/16" deep were left in the bar where they were driven across its surface! I finally have had no more trouble since I went to three 1/4" Allen set screws which are inset into drilled holes in the bar 1/4" deep. I have seen wooden drums on winches, and think one could get away with it if hardwoods were used and/or plywood was laminated with its grain on edge to resist the pressure.

Flanges can be mounted by using wood screws into the end of the hub, as I found them to be strong enough in my redwood version. You could also use a 3" hub rather than 2" as I have done. You will have to pulse the winch more, as it will be quite fast then. Resist the urge to make the drum narrower. It is important that the line wind on a small hub to keep the ratios correct. If a narrow hub is used, the effective diameter will be considerably enlarged by the time a glider reaches transition and you will have to pulse the winch more than you would otherwise. Since it is at this point that the glider becomes most "squirrelly", and it is near release that maintaining altitude

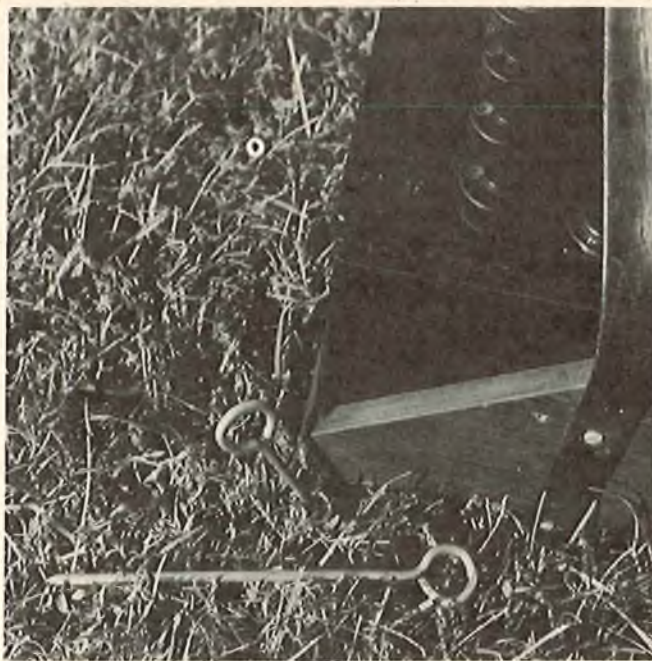
becomes difficult, I recommend that you try to keep the winch slow at that point by keeping the hub diameter small.

The completed drum must rotate on some type of bearings. I used some ball bearing races from an old motor. The outside diameter was about 1" and the inside diameter was 5/16". Any similar bearings could be used and you could also use Oilite bushings. The bearings can be mounted either in the drum hub or in the main supporting members. Since my supporting members were 1/2" plywood and the hub was aluminum, I chose to mount the bearings in the aluminum with a press fit after I bored the solid bar to the correct size on

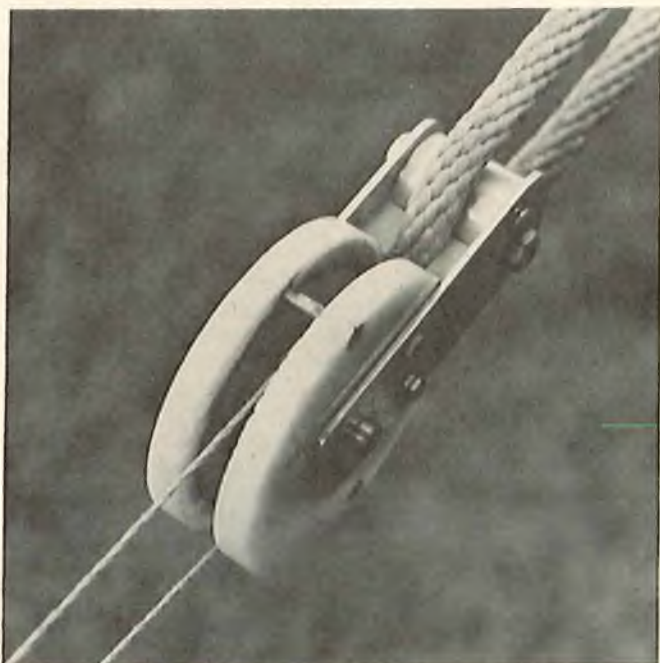




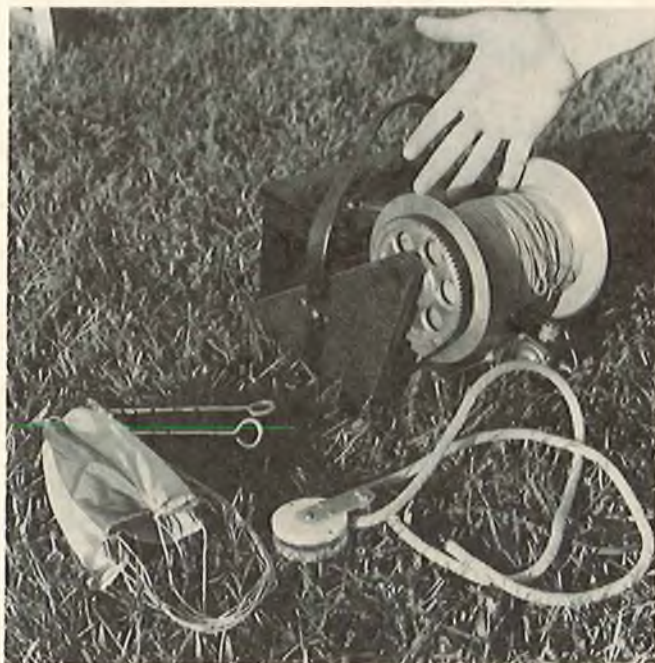
**A view of the actuating foot switch from Radlo Shack. It is modified as described in the text.**



**The miniature tow winch is staked to the ground with these aluminum tent pegs.**



**A close-up photo of the unique turnaround pulley designed for use with the winch.**



**Author's hand shows comparative size of completed unit. Turnaround and chute shown.**

the lathe. I see no reason why flanged bearings or pillow blocks couldn't be mounted on the main supporting members and a shaft driven through the hub and then set in the bearings. The large pulley is mounted on the side of one of the drum flanges with 4/40 flat head bolts countersunk into the inside of the flange so the winch line will not catch the bolt head. I actually mounted one of my bearings in this pulley, but if you choose not to, you could cut the entire center of the pulley out and only use the perimeter. Use more bolts then, and be careful not to deform it when mounting it (I really have become a weight freak).

On my first winch, I had an adjustment

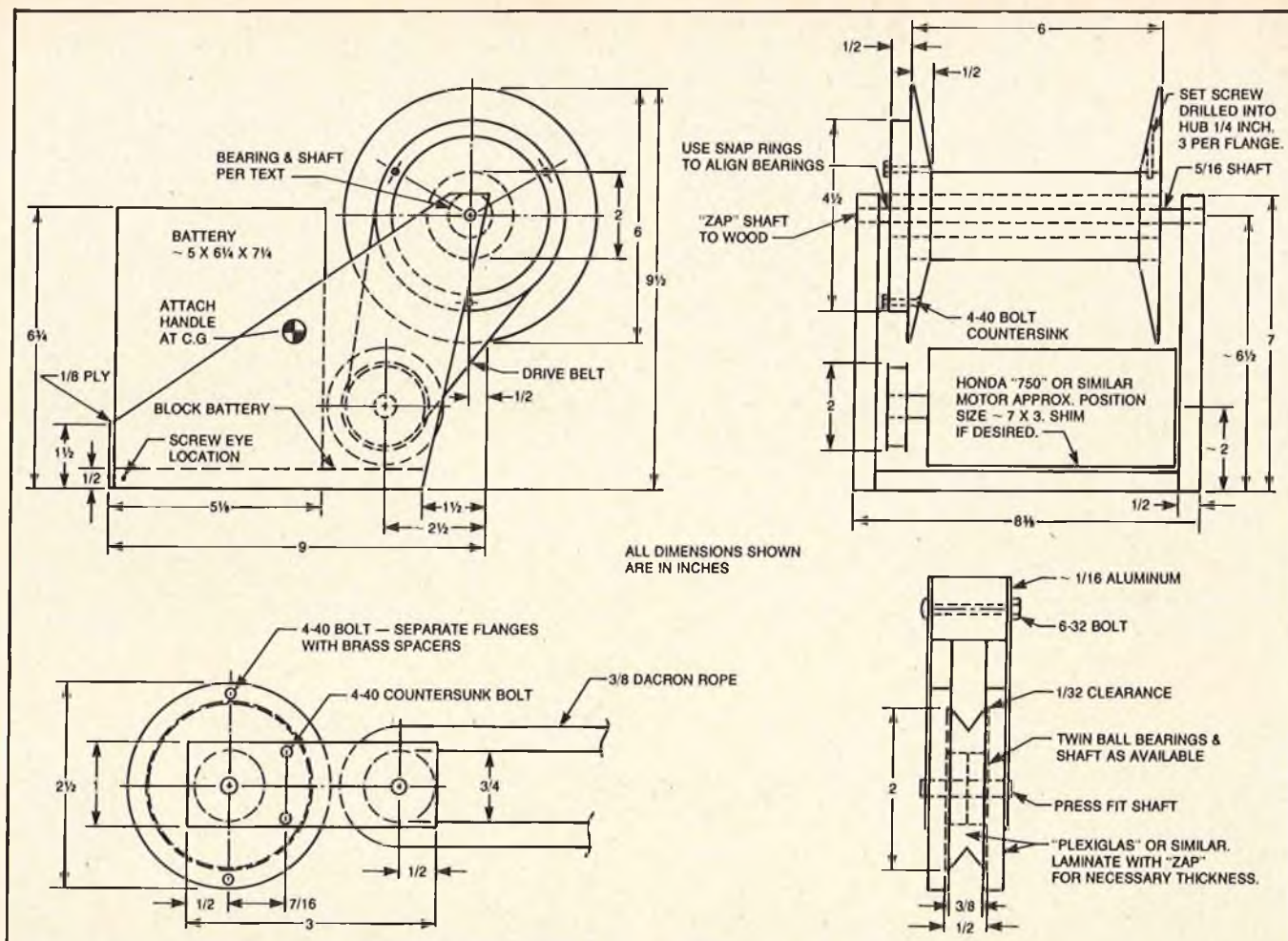
for belt tension. As the tension of these belts is not critical, I omitted it on this winch. The motor is bolted solidly to the bottom of the winch, the drum is mounted on the main support members and the members are then mounted onto the bottom of the winch with the belt just tight. The correct belt tension is just loose and if you do it right, the belt will be just a bit tight when the winch is finished, but will loosen very slightly after a few launches as the wood settles and the belt stretches. The settling and stretching is very slight, so be forewarned! If you prefer to have some latitude for error, you could shim the motor with washers or an aluminum plate and add

or subtract shims as required to make the adjustments.

A 12 volt starter solenoid can be obtained for less than \$5.00 from discount auto parts houses. Wiring does not have to be as large on this winch as on a 6 volt winch. Not only does the motor draw far fewer amps, but the distances are shorter. I find that the large size lamp cord (16 gauge), available from your local hardware store, to be perfectly adequate if both conductors are used together (this makes it about the same as a single 13 gauge wire). Such wire is adequate for runs of no more than 6 feet or so.

The handle for the winch is made from an old leather belt. My earlier winch had





a nice metal handle, but it weighed more, was more difficult to mount, and was not as comfortable. Incidentally, my earlier winch weighed 27 pounds. I was able to add an additional 11 pounds in battery to the new one, but kept the overall weight to only 32 pounds by shaving weight elsewhere . . . such as the handle. The handle may not be pretty, but it is highly functional!

I recommend that the motor be left completely exposed. If used repeatedly, it gets very hot and needs all the cooling you can find. This is also a good reason for avoiding the smaller motorcycle motors.

The cheapest place to get nylon line of small diameter is from your local upholstery shop. You can get one pound of line used for sewing on buttons for about \$7.00. There is about 700 yards of line per pound. It is not braided line, it is twisted. It is 75 pound test, small diameter, and is adequate.

Don't omit the screw eyes on the rear corners of the winch. These are required because the winch must be staked to the ground. It is light enough that it will actually slide along the ground when pulling hard. Furthermore, because of the width of the drum, it will rotate easily and wind heavily on one side with the possible danger that the line could jump the drum, breaking the line and stalling your ship. And if your glider stalls near the

ground . . . I use the aluminum alloy straight wire tent pegs used for backpacking. They weigh less than 1/2 ounce each and can be driven into the ground with your hand.

The foot switch is obtained from Radio Shack for about \$4.00. It is modified by taking it apart and using 18 gauge lamp cord attached to a phone plug which plugs into a phone jack on the winch. A pair of 1" bolts are sharpened and mounted in the base of the switch so that it will not move around when being pulsed. It works well in solving that problem.

I carry the stakes, parachute, foot switch, and turn-around pulley in my flight box; along with my transmitter, water bottle, etc. I use a large aluminum fishing tackle box for this purpose. The winch is easily carried in one hand and the box in the other. Usually two or three of us can carry everything onto the field in one trip.

When setting up the winch, be very careful about making sure that the line coming from the winch drum pays out exactly perpendicularly. It is best from an efficiency standpoint that the line be in a straight line from the drum to the turn-around pulley. When staking down the winch put in the stakes at 45 degree angles because the unit tries not only to slide forward, but tries to lift up the battery. After it is staked, push it forward

firmly to make sure it is seated against the stakes and cannot shift more. If the line is not perpendicular, then remove one peg and rotate the winch so it is, and reinsert the stake. After the first launch, check to make sure the line is winding evenly on the drum.

When using the winch for the first time, do not be fooled by the sound. Go by the feel of the line tension. Actually, nobody has had any trouble on their first launch with the winch, but it is a bit strange at first. The unit has a considerably slower response when pulsing — that is, you do not have to pulse as rapidly as with a conventional winch because this winch is not so quick to stop and freewheel in reverse under line tension. If the winch actually gets going in reverse (typical on a windy day) and you pulse it to make it start pulling again, it will make an odd noise as though it were stripping the teeth off the belt. As near as I can tell, it is *not* causing the belt to jump (I had it *very* tight on the first winch for one flight to check this out . . . it could not jump and it didn't . . . but it still made the sound). I still do not know what makes it do this, but it does not harm anything so I don't worry about it anymore.

A few words about batteries are in order as the maintenance of lead acid storage batteries is neglected in modeling circles to my knowledge. When using

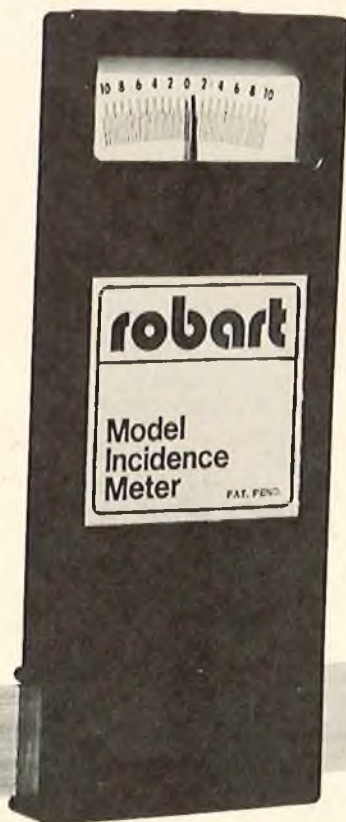
to page 103



# WANT TO TAKE THE GUESSWORK OUT OF YOUR MODEL ALIGNMENT?

MAYBE A MODEL  
INCIDENCE METER  
WILL HELP - - -

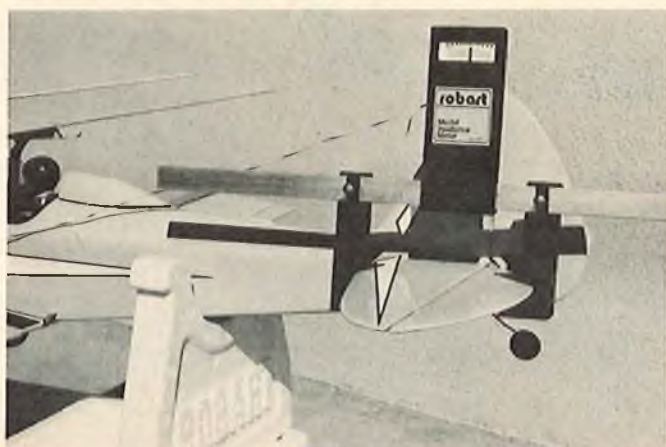
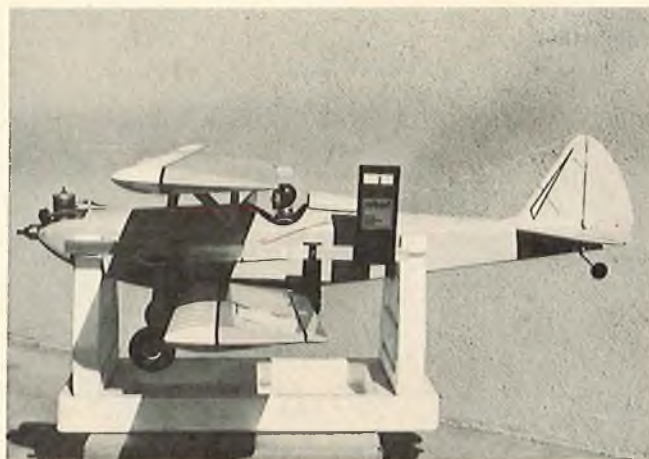
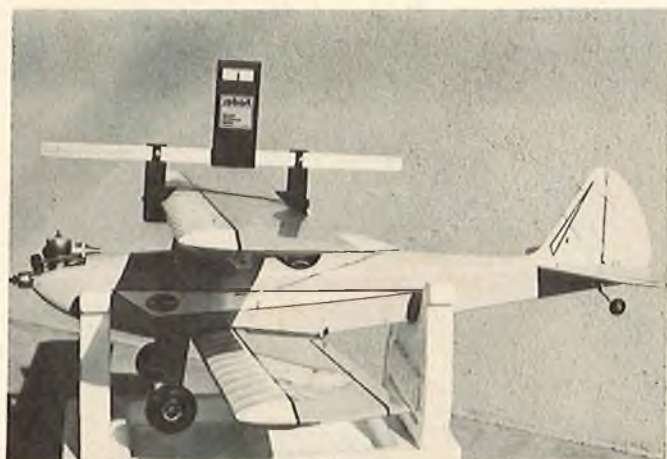
BY DICK TICHENOR



● Eyeballing is good if you are girlwatching, but it can be misleading if you are checking the alignment of your airplane.

Robart Manufacturing Co., P.O. Box 122, Wheaton, Tennessee 60187, has an Incidence Meter that is accurate and very easy to use. The meter and two V-notched locators slide on a 1/8" x 3/4" aluminum bar that is long enough to handle up to a 16" wing chord. One of the locators has a flange that slips over an engine propeller shaft to measure the angle of down thrust. The bottom edges of the locators are flat and parallel so that a horizontal reference can be established. The scale on the meter is graduated in 1/2° indications.

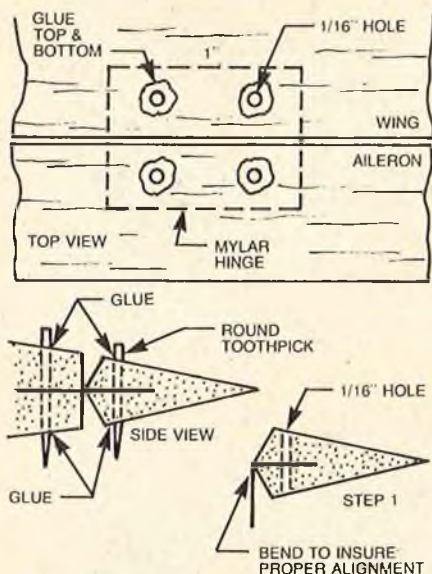
We have found Robart's Incidence Meter most useful in checking the alignment of our models and it certainly has put a stop to the arguments over how the models are set up. The photos show the typical method of checking alignment with a Robart Model Incidence Meter. □





# FOR WHAT IT'S WORTH

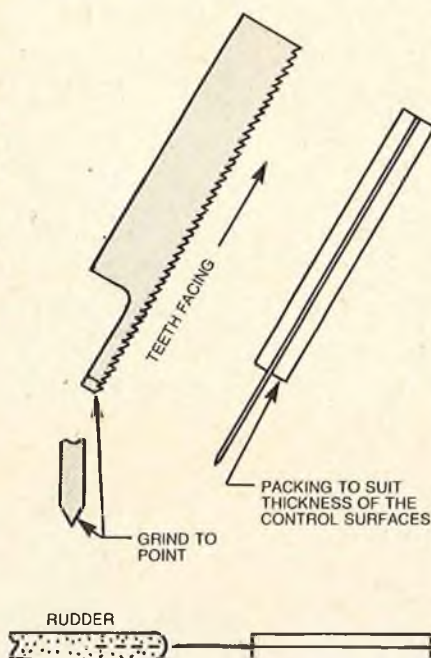
While there have been numerous methods suggested for hinging your control surfaces, this idea suggested by Terry Terrenoire of Endicott, New York, is one of the best we have seen to date. First, using your favorite method, cut slots in your control surface and the flying surface, making sure to align the slots as accurately as possible. Now, cut flexible mylar material to 1" widths for your hinges. Bend the hinge at the hinge line to a 90° angle and push all the way into the slot in the control surface. Do the same for all hinges in that surface. Next, drill two holes, 1/16" in diameter through each hinge and control surface. Insert one half of a round toothpick into each hole, locking the hinge in place. Now you use the only glue necessary. Put a drop of Zap, Hot Stuff, or Super Glue 3 at each side of the surface where the toothpick protrudes. The glue will flow into the pick and the balsa and fuse them together. By the time you have done all of the hinges on that surface they will be dry enough to proceed to the next step. Using side cutters or nail clippers, cut off the protruding toothpick. Sand thoroughly, and cover using your favorite method, and you will have a completely invisible hinge. Terry has used this method on several planes in the past year and has found it to be very strong, slop-free, accurate, easy and fast. A complete hinging job on ailerons, rudder, and elevator for a .60 size ship can be done in 30 to 40 minutes.



Allen G. Butler of Winburne, Pennsylvania, has built quite a few Lanier models and has found this little suggestion to work quite well with the application of the stabilizer and aileron surfaces to the model. Most of the kits come with the hinges fastened to the foam wing and stabilizer, but you do have to fasten the hinges to the stabilizer and aileron

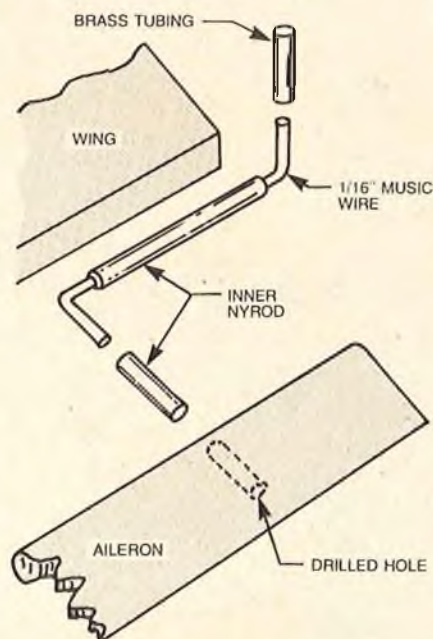
surfaces. After having slid the surfaces onto the hinges sticking out from the wing and stabilizer, bend them as far as possible from the surfaces without pulling the hinge from the slot, and let a drop or two of Zap or Hot Stuff flow into the slot of the control surface hinge. Don't forget to safety the hinge with the miniature spikes provided with the kit — it may save a disaster.

T. Nash of Napier, New Zealand, recommends the following tool for making hinge slots. It is fabricated out of old engineers hacksaw blades and will put clean and true slots in balsa for elevator and rudder hinges. First, snap a hacksaw blade into pieces 4" to 5" long. Next, grind a portion out of the blade to suit the depth of hinge and so that it leaves a 1/8" wide strip along the teeth side. Keep the angle of the teeth towards the handle which will ensure that all excess material will be cleaned out of the hinge slot. Finally, grind a point on the end of the 1/8" wide strip which will ensure easy penetration of the balsa by the blade. Contact cement balsa handles to each side of the blade to the correct thickness so that your hinge tool aligns to the center line of the wood that has to be cut. Engineer hacksaw blades come in three sizes of teeth to the inch — 32, 24, and 18. Number 18 gives you a slot 1/16" wide.

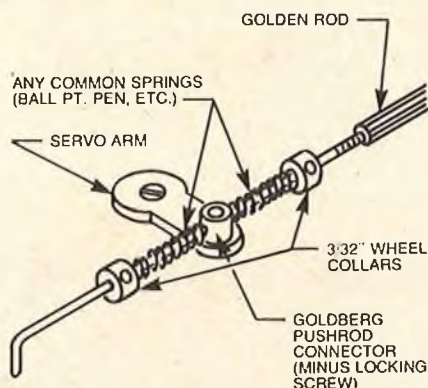


Here is an aileron hook-up for small aircraft which has been used successfully on a .35 powered Headmaster and several smaller aircraft as suggested by Richard L. Barckhoff of McGuire AFB, New Jersey. As shown in the sketch, the second bend in the wire is made after passing through the NyRod. The inner

NyRod is epoxied in the aileron then, when hinging, the wire is slipped into the NyRod. The wire does not have to be epoxied into the NyRod in the aileron. Brass tubing is soldered to the wire to bring the diameter of the wire up to standard size for aileron fittings.



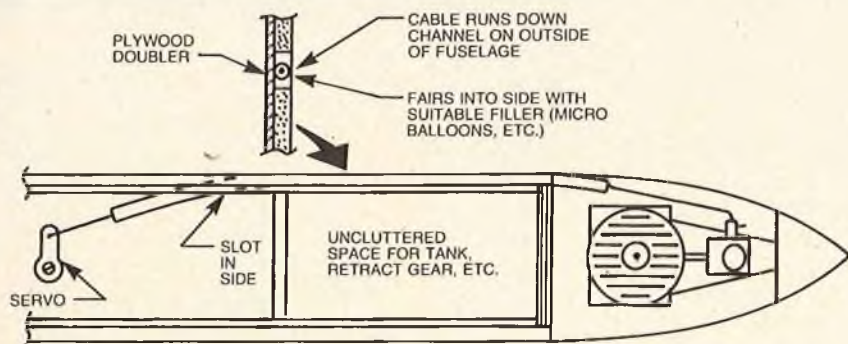
John A. Novotny of Mt. Laurel, New Jersey, submitted this sketch of a device he uses for a throttle over-ride, or as a shock absorber for a nose wheel. John uses this arrangement because the tension is easily adjustable simply by varying the distance between the collars. If extra tension is needed, two or more springs can be "woven" together so as not to diminish the travel.



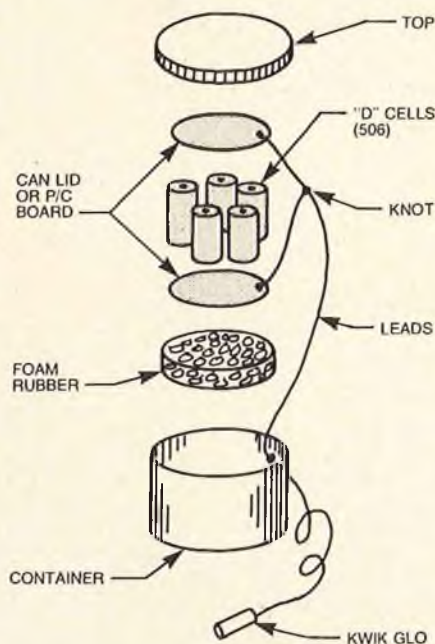
For those builders who secure their hinges with pins, a neat technique is to put a drop of Zap or Hot Stuff on the nubs of the pins protruding on the underside of the surfaces. The material will run down the side of the pin and secure it, and keep it from coming out from vibration. This is much easier and neater than using epoxy on the head of the pin. This idea was submitted by A.L. Lemel, M.D. of Charleston, South Carolina.



# FOR WHAT IT'S WORTH



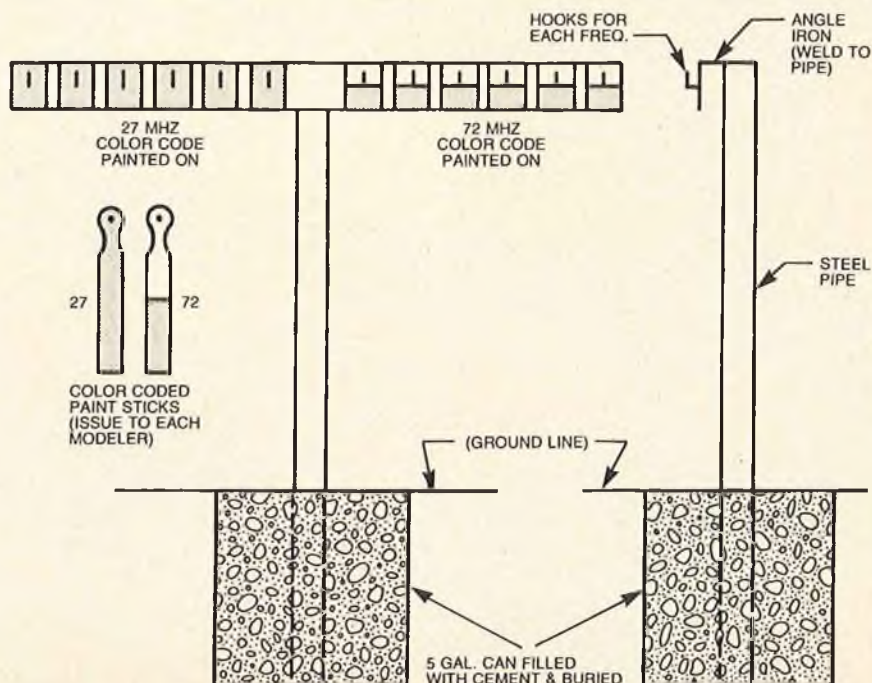
In some of the modern slim line fuselages it is difficult to get all of the hardware into the nose along with the tank, engine, engine mount, nose leg, and all their various linkages. One way to get more space is to put all cable runs on the outside of the fuselage, recessed into the wood and covered with a filler as shown in the sketch. This can be done with nose wheel steering cable, retract pushrod, mixer control cable and the like. This idea was submitted by Ray Jennings of Antrim, North Ireland.



Msgt William D. Cartwright, Jr., submitted this idea for all modelers who use a rechargeable battery for their glow plug. Based on the premise that eventually everyone has a dead battery sooner or later just when you want to fly, and that 1½ volt size D flashlight batteries are always available somewhere at any hour of the day or night, the following idea was submitted. First, make a battery container from a 1 pint twist lock food container (plastic or nylon) available at most variety or department stores. Make two contact plates from tin can lids or phenolic PC board material. Attach one wire lead to each contact plate.

Make a restraining knot in the leads and pass through a hole in the side of the container and fasten your favorite glow plug clip to the other end. Next, place a piece of foam rubber in the bottom of the container thick enough to give good pressure when the container is closed. Place one contact plate in the container on the foam and drop in 5 or 6 D-size cells (as many as it will hold) all facing the same way. Put the other contact plate on top and close the container. When the top is closed, the foam rubber in the bottom must be compressed for good contact. This makes a good primary and an excellent back-up system. Don't wait for a dead battery to build one, but plan ahead and keep one as a spare in your field box.

Are you tired of forever replacing lost frequency clothespins? Do you need a new system of frequency control that's as good or better than the clothespin method? Then we suggest that you try this system which the Berkshire R/C Flying Club of Pittsfield, Massachusetts, has been using successfully for over six years. Submitted by Steve D'Angelo,



President of the club, each member has a color coated paint stick for each transmitter. When he is ready to fly, he simply hangs the stick on the frequency control post. If someone is already on that frequency, wait until the post is clear, and hang your stick and fly without fear of being shot down.

While getting his Littlest Stick ready to fly, Luke Akemon of Sacramento, California, discovered that all the foam he had to pack his receiver and battery pack was too large for the small aircraft. Just then he spotted something his wife was using in the dryer to soften the clothes — called Cling Free. This is thin foam material and, after the foam was used several times in the dryer, it is usually thrown away. Luke used it to pack his receiver and battery pack and finds that it not only works great, but makes the inside of his airplane smell quite nice!

William Davis of Beech Grove, Indiana, recently solved a small problem he was having with his Kavan electric starter. Since the rubber is of a harder compound than most of the others, it was slipping badly on the spinner. By cutting grooves in the side using a Dremel Moto Tool, and forming a slanting tread, he has eliminated this slipping completely.

D.E. Rayfield of Trion, Georgia, has found a very good container which will protect batteries and aircraft. This is a Playtex nurser plastic baby bottle refill. A 500 MAH battery is almost a perfect fit. The bags are very tough and the author has never found one that leaks. □



# ENGINE SIZE, WING LOADING AND RELATED PROBLEMS OR, WHAT HAPPENS WHEN THE SIZE OF A MODEL IS CHANGED

BY TED OFF

● All construction articles in RCM and most kits show the wingspan of the model, the wing area and recommended weight and engine size. There is obviously meaning to these numbers. Then, we often divide model weight by wing area and come up with something called *wing loading*. Likewise, we can divide engine power by model weight and end up with *power loading*. These numbers have some meaning too. It is also apparent that they have something to do with the way a model flies. With some math, most of which is relegated to some notes at the end, and a few graphs, I'd like to talk about some relationships among these numbers and how they affect the "flyability" of a model. Specifically, I will show that there is a rational way to change the size of a particular model to fit a different engine, to pick an engine size for a new design or scaled down full size plane, and indicate why smaller models are harder to fly.

## Graphs

Before diving into theory, some comments on graphs (if you're familiar with slide rules and logarithmic graphs, skip this part): Equations are good for engineers, but a picture in the form of a graph makes it easier for all of us to see what these equations mean. Most of the graphs we're used to looking at are simple arithmetic graphs where the numbers are spaced out evenly on the abscissa (the horizontal axis) and the ordinate (the vertical axis). Such a graph would be like Figure 1 which shows what wing loadings would be for various wing areas and model weights.

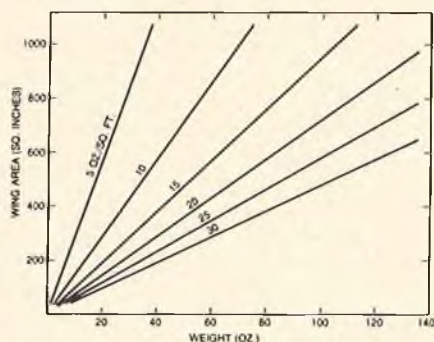


FIGURE 1: WING LOADING ON ARITHMETIC GRAPH

As I will show, most of the numbers mentioned at the start of this article are related to each other by power functions. For example, wing area changes with the square of the scale of a model (a 1/4 scale model of a full size plane has 1/4<sup>2</sup> or 1/16th its wing area. Likewise a 1/6

scale model has 1/36th the wing area of its full size counterpart). If we draw a graph of this relationship on arithmetic graph paper, we end up with curved lines like Figure 2, where I've chosen to

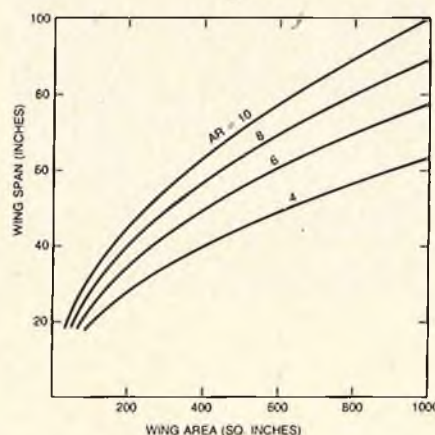


FIGURE 2: ASPECT RATIO ON ARITHMETIC GRAPH

plot wing span versus wing area for various aspect ratio wings rather than model scale. Curve lines on graphs are not only difficult to draw, they're hard to use.

It turns out that if we use logarithmic graphs, where the abscissa and ordinate look like parts of a slide rule, equations involving power functions plot as straight lines. Figures 3 and 4 show what the previous two graphs would look like if they were drawn on a logarithmic graph. So, the next few graphs which are the important ones of this discussion are logarithmic graphs.

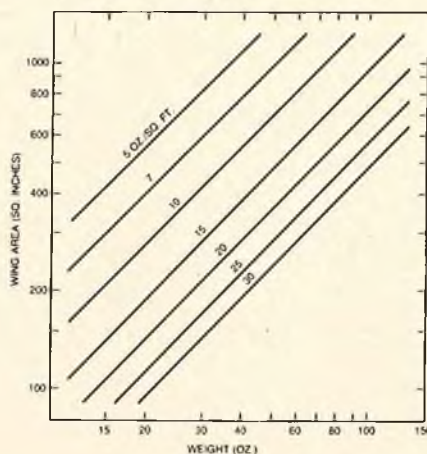


FIGURE 3: WING LOADING ON LOGARITHMIC GRAPH

These logarithmic graphs are just as easy to read as the other kind except that you have to remember that spaces

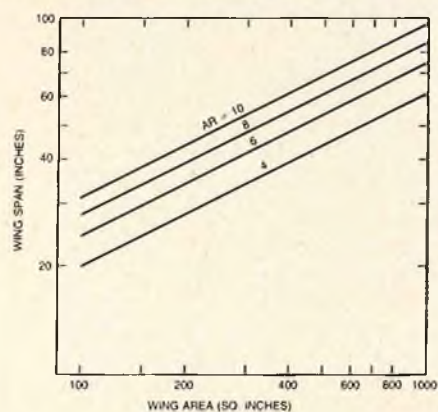


FIGURE 4: ASPECT RATIO ON LOGARITHMIC GRAPH

between the numbers on the abscissa and ordinate are like a slide rule. They change and cannot be divided equally if you are going to interpolate a number. For example, 15 is not halfway between 10 and 20 on a logarithmic scale. It's a little closer to 20.

## Wing Loading

Wing loading is a term that appears often in articles on R/C models. I'm continually reading that a good pattern ship should have say a 20 oz./sq. ft. wing loading while 10 oz./sq. ft. is heavy for a glider. But, when this number comes up, there seems to be something left out — no mention is made of the model size. But, if we draw a graph of wing loading versus model size (say wingspan) and plot on this graph various pattern ships people are flying, we get something like Figure 5. The successful pattern models

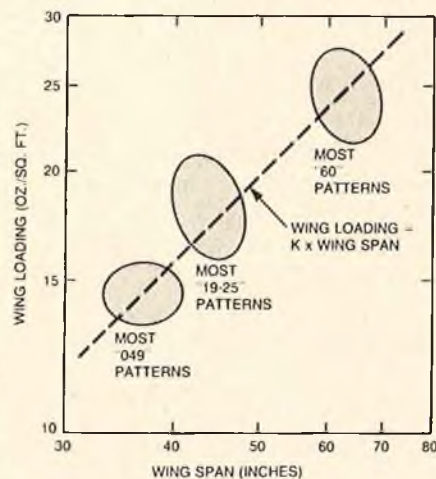


FIGURE 5: WING LOADING OF VARIOUS "SIZES" OF PATTERN R/C

appear to have lower wing loadings the smaller they get! This same exercise



To carry this wing loading thing a little further: A full size Beechcraft Bonanza has a wing span of 33½ feet and a wing loading of about 17 lbs./sq. ft. (270 oz./sq. ft.). A 60 scale model might be expected to have a span around 67" and a wing loading of 45 oz./sq. ft. An indoor peanut Bonanza's wing span is 13" and should have a wing loading under 5 oz./sq. ft. Yet, all three of these flying machines fly well.

Let's see if we can figure out how wing loading should change with model size. If one scales down a solid object to half size, its area will be 1/4th of the original and its weight 1/8th of the original. (A 1/4th scale model would have 1/16th the area and 1/64th the weight). We can express this as a simple rule: If  $S$  is the wingspan of a particular flying machine, its wing area can be defined as  $A = kS^2$ . Then, any different size model of this same flying machine would have the same value of  $k$  and for it also  $A = kS^2$ . Likewise, the weight of this same flying machine could be expressed as  $W = kS^3$  and it and its models would have the same value for this  $k$  (using  $k$  to mean any constant in an equation. The  $k$ 's aren't the same from one equation to another). This relationship where  $A = kS^2$  and  $W = kS^3$  is often called the "square cube law" because it follows that  $W^2 = kA^3$ .

### Wing Loading and Performance

WING AREA (SQUARE INCHES)

WING LOADING (OZ-SQ FT)

POWERED GLIDER

TRAINER

PATTERN & SPORT

HEAVY

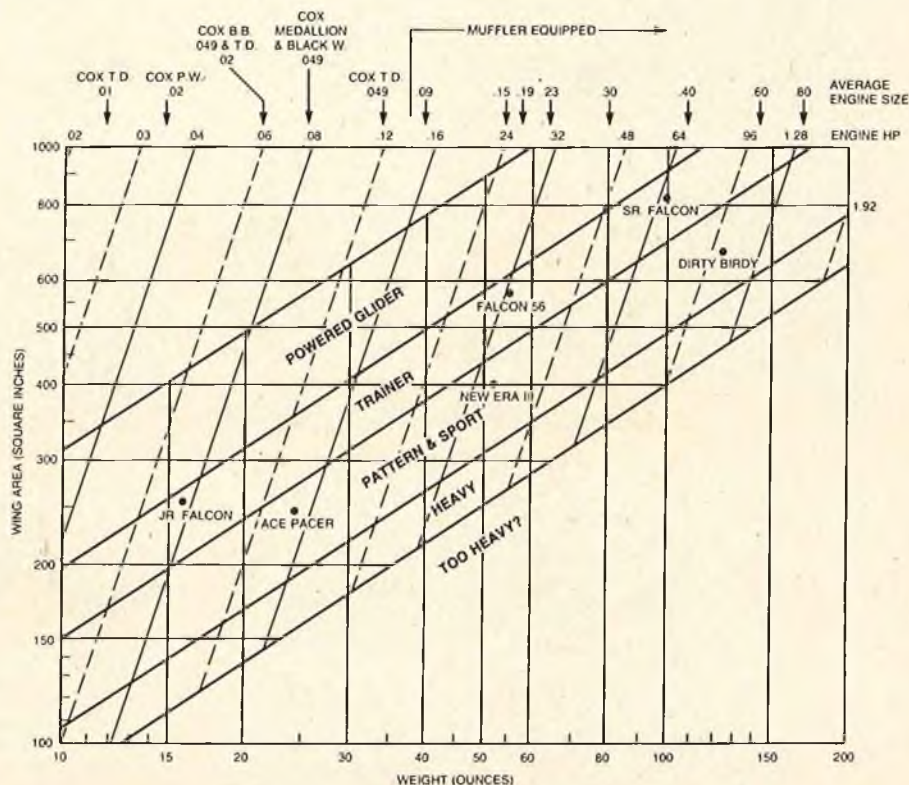
TOO HEAVY?

SLOPE A' = KW<sup>1/3</sup>  
OR WING LOADING = K x SCALE  
= K x A 1/2  
= K x W 1/3

WEIGHT (OUNCES)

the "relative" slow speed flight of a model which, in turn, is determined by the wing loading (see note 2). Thus, I've chosen on this Figure 6 to label various zones: powered glider, trainer, sport and pattern, heavy and too heavy (?). These zones are obviously in decreasing ease of flying. The boundary lines are based on plotting a hundred or so successful models. They are, however, not absolute. For example, some powered gliders (especially the electric ones) fall in

A special comment on the "heavy" and "too heavy (?) " zones: This is the area where many detailed scale models fall. Given a big enough power plant, any R/C model with proper stability can fly



91



# TORQUE RODS — STAGE 2

BY COLONEL JOHN A. deVRIES

● There are a lot of ways to translate servo "push" into aileron action. In *Bellcranks Are For The Birds* (RCM, February 1976), we described the simplest of aileron actuation systems — the torque rod. Its advantages, over "round the corner" bellcranks, are readily apparent. Torque rods minimize mechanical connections and their friction. They may be "buried" in the wing structure and thus eliminate all air resistance caused by bellcrank-to-aileron horn pushrods. From the scale builder's viewpoint, torque rods most closely duplicate full scale practice and, thus, are an attractive system. From a constructional viewpoint, however, torque rods pose a rather difficult problem. They must be aligned, within the wing structure, with the hinge line of the aileron. Top-hinged ailerons force the builder to either inlet the torque rods in the upper wing surface or forego them entirely. In the ideal torque rod installation, the aileron hinge line should be perpendicular to the wing's center line. Wings with sharply swept-forward trailing edges and corresponding 'angled' aileron hinge lines, require that the 90° bend at the outboard end of the torque rod "work" against the aileron. This, in effect, cuts down on the maximum aileron throw inherent in the torque rod's geometry.

What we're suggesting to you in this article is that there's a third way to move ailerons which combines a bit of bellcrank and a tad of torque rod that adopts the advantages of each system and minimizes the disadvantages of both. We call it the "Stage 2 Torque Rod".

The "heart" of the Stage 2 system is



**"Heart" of the Stage 2 torque rod system — the tabbed wheel collar. Photo shows aileron-end collar with .032 brass strip drilled and silver soldered in place. The distance from collar hole to tab hole is about 1/4".**

the lowly wheel collar. You'll need two of 'em per aileron plus some .032 x 1/4" brass strip, a Kwik Link or two, plus appropriate lengths of NyRod tubing and music wire. In this system, the torque rod (music wire) fits into the nylon tubing (which is built into the wing). A tabbed wheel collar is affixed to each end of the music wire after it's installed in the tubing. The aileron servo is connected to the inboard tab, the aileron pushrod to the outboard.

The first step in building the Stage 2 system is the preparation of the tabbed wheel collars. Two are required for each aileron — a long one and a short one, their dimensions depending on your model. Begin by slotting the wheel collars half-way through with a razor saw. The slot should be perpendicular to the hole in the collar and on the side opposite the set-screw hole. After the slot is of the proper depth, re-cut it with a standard hack-saw blade to widen it. The

brass tabs are pre-drilled to accept the aileron pushrod (one hole in the shorter, aileron tab) and the servo pushrod (several holes drilled on the center line of the longer servo end tab). The brass strips are "bottomed" in the slots in the wheel collars and silver-soldered in place (soft solder is okay, but silver is stronger).

Using a drill the same diameter as the wheel collar's hole, the bit of brass tab *inside* the hole is cleared out and the set-screw replaced in its threaded location. With a bit of file work, the tabbed wheel collars are cleaned of flux and are ready for installation.

Just how long should the brass tabs be? In the case of the aileron end tab, it should be only as long as is necessary to clip a Kwik Link to it without binding. From the center of the wheel collar hole to the center of the hole in the tab should be about 1/4" — because the entire tab is designed to be contained within the wing structure. In thin wings, the aileron pushrod may be attached to the tab with a simple 90° bend (as shown in the photograph) to keep the tab short. In extremely thin wings, a slot may have to be cut in the wing's surface to clear the tab, although this partially defeats the anti-drag feature of the installation. Ideally, the outboard tab should be as long (from torque rod center line to the drilled hole in the tab) as the distance from the aileron's hinge line to the aileron pushrod's connection to the aileron — giving a 1 to 1 mechanical ratio.

The servo tab must be substantially longer, since most aileron adjustments (total throw, alignment and trim) will be made with the servo pushrod.

Assembly sequence for the Stage 2 system is as follows:

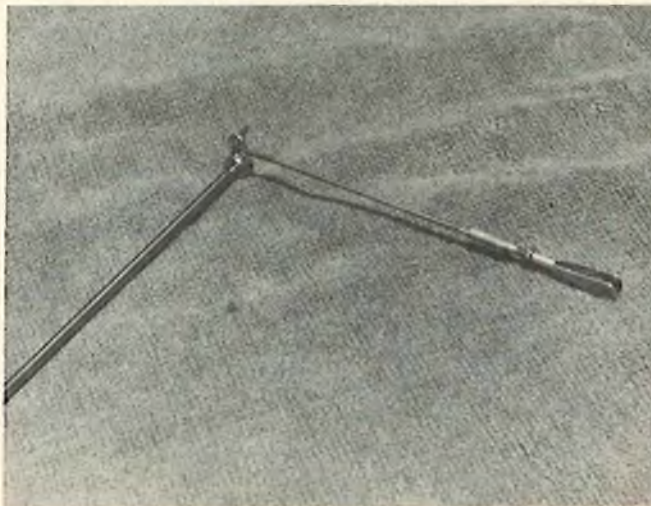
(1) Install NyRod tubing through wing ribs or in a prepared channel in a foam core wing. The tubing acts as an aligning bearing for the music wire torque rod.

to page 101

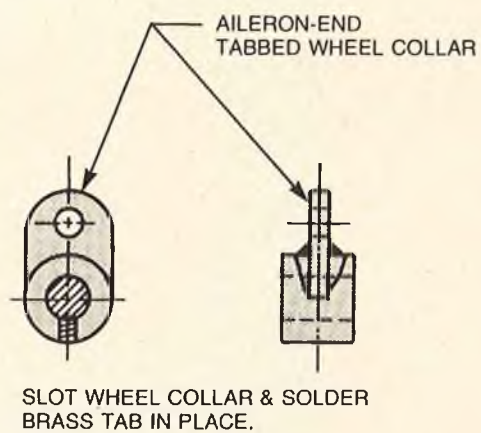
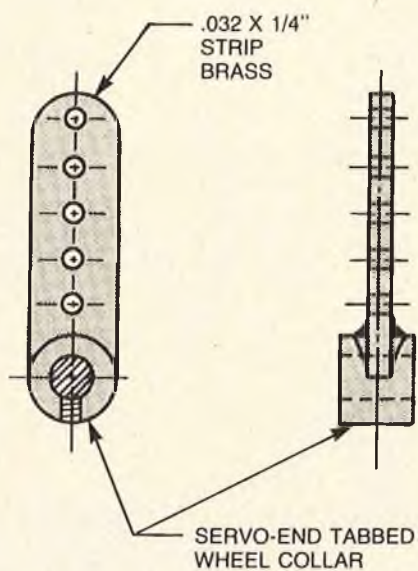
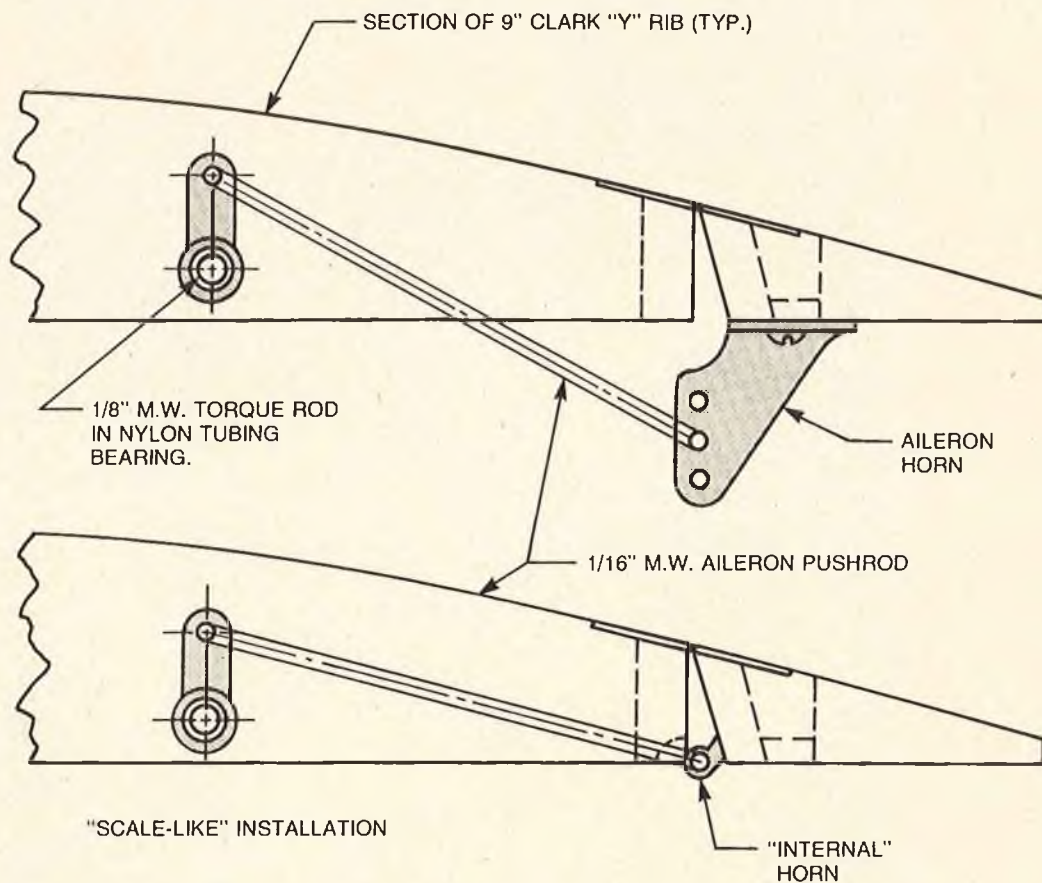
**Aileron end of the Stage 2 torque rod — in this photo, a length of 1/8" music wire. The torque rod rides in a nylon tube bearing, which is glued into the model's wing structure.**



**Stage 2 torque rod assembled with aileron pushrod. Kwik Link is not strictly necessary if you're an accurate wire bender since aileron adjustments may be made at the servo end of the torque rod. End of the aileron pushrod may be connected to an internal or external aileron horn.**







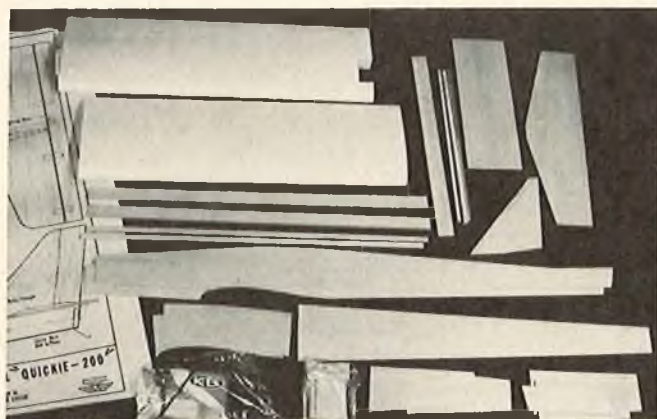
**STAGE 2 — TORQUE RODS  
BY:  
COL. J.A. deVRIES, USAF RTD.**

**NO SCALE FOR LARGE  
TABBED WHEEL COLLARS!**



# RCM PRODUCT TEST

**GLEN SPICKLER  
RADIOMODELS  
QUICKIE 200**



● The Quickie 200, designed by Ronald Shean, and first appearing as a construction article in R/C Modeler Magazine, has been kitted by Glen Spickler Radiomodels, 4208 Santa Cruz Street, Bakersfield, California 93307. Priced at \$19.95, and available from the manufacturer, or from your local retail outlet, the Quickie 200 is designed for this specialized class of pylon racing. The wing span is 34 $\frac{3}{4}$ " with a total wing area of 208.5 square inches. A semi-symmetrical airfoil is used and the aircraft is designed for .049 to .051 cubic inch displacement engines and 2 channels of control operating elevator and aileron. The kit is of conventional balsa construction and includes the landing gear, aileron horns, tail skid, elevator horn, and hinge material in the kit. One sheet of plans measuring 35" x 22 $\frac{1}{2}$ " is included in the kit along with a 1 page instruction manual.

All parts are pre-shaped and no die-cut parts are used. The foam wing panels have pre-cut dihedral angles, trailing edges, and servo cutouts. Our prototype weighed 20 ounces ready to fly for a wing loading of 13.80 oz./sq. ft. Yellow Flite Kote was used on the wing, stabilizer and rudder. Metallic blue MonoKote was used to cover the fuselage while MonoKote trim was used for the lettering. A Cox Tee Dee .051 was used for power with a 1 ounce tank in the fuel compartment. An RS two channel radio was used for control.

The Quickie 200 is a quick and easy plane to build and the novice builder will experience no difficulty. As previously mentioned, the foam wing panels have factory pre-cut dihedral angles, trailing edge, and servo cut-out which makes for ease of wing assembly. The Quickie 200 is easy to build and easy to fly for anyone with a minimum of aileron experience. Take-offs are not difficult when headed into the wind and landings are a cinch with this light wing loading. It is an excellent Quickie 200 racer and would make an exceptionally good ball park sport aircraft if a Baby Bee or Golden Bee engine was used. An excellent buy at \$19.95. □

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging			●			Pre-Shaped Parts	●				
Plans			●			Parts Match to Plans		●			
Written Instructions				●		Overall Parts Fit	●				
Quality of Hardwood		●				Ease of Assembly	●				
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials		●				Flight Performance		●			
Accessories		●				Overall Appeal	●				
Die-Cutting			NA								

E = Excellent / G = Good / A = Average / F = Fair / P = Poor

## SPECIFICATIONS

Name	Quickie 200
Aircraft Type	Quickie 200 Pylon
Manufactured By	Glen Spickler Radiomodels 4208 Santa Cruz St. Bakersfield, California 93307
Mfg. Suggested Retail Price	\$19.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Quickie 200 Pylon Racing
Wing Span	34 $\frac{3}{4}$ Inches
Wing Chord	6 Inches
Total Wing Area	208 $\frac{1}{2}$ Square Inches
Fuselage Length	27 Inches
Radio Compartment Dimensions	(L) 6 $\frac{1}{2}$ " x (W) 2" x (H) 2"
Wing Location	Low Wing
Airfoil	Semi-Symmetrical
Wing Planform	Constant Chord
Dihedral	1/2 Inch
Stabilizer Span	11 $\frac{1}{4}$ Inches
Stabilizer Chord (incl. elev.)	3 $\frac{1}{2}$ "
Total Stab Area	42 $\frac{1}{2}$ Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	4 $\frac{1}{4}$ Inches
Vertical Fin Width (incl. rud.)	3 $\frac{1}{2}$ "
Mfg. Rec. Engine Range	.049-.051
Recommended Fuel Tank Size	1 Oz.
Landing Gear	Conventional
Recommended No. Of Channels	2
Recommended Control Functions	Elev., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	Very Complete
Plan Size	35" x 22 $\frac{1}{2}$ " (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (1 page)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	20 Ounces
Wing loading based on rec. flying wt.	13.80 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly	20 Ounces
Wing Loading	13.80 oz./sq. ft.
Covering & finishing materials used	MonoKote, Flite Kote
Engine Make & Disp.	Cox .051 Tee Dee
Muffler Used	No
Radio Used	RS
Tank Size Used	1 Ounce



# WHITHER THERMAL SOARING?

BY DON BURT

**M**uch has been said and written over the past year about the desirability of holding thermal soaring contests which would encourage more "sport" fliers to enter. Two solutions widely-promoted are the inclusion of a "Standard" class event for two control function sailplanes under 100" span, or the split of the entries into two or more categories based on proficiency. I think everyone knows by now that the first "solution" — isn't! Standard class sailplanes like the SFM Bunny, Dodgson Designs Gull, and Mark's Models' Windfree and others can, and have, aced-out the best of the "open" class ships in contests where no such class distinction was made.

On the face of it, the second proposal seems to have more to recommend it, but does anyone really want a trophy that might as well be inscribed "Best of the Worst"? Another bad feature of currently proposed proficiency classes is that progress is based on accumulated contest placings, and not on average performance of the individual. Therefore, if the system is to work, I believe that the Novice-Expert split should be made on a basis of average scores in prior contests. This could be at a level of 60% of perfect score (or less in areas where lift conditions are poor). This would allow the average flier to remain in a competition level matched to his average performance, rather than shunting him up into an instant-expert.

However, this does not bring in the other "maverick", the quite-expert flier, who only flies for fun. Why do these fliers never enter a contest? My guess is that it doesn't give them enough flying, that the discipline of precision time and landing is distasteful, and a bad flight, for whatever reason, ends the contest as far as gaining recognition for one's flying skill is concerned. Could a contest incorporate some of the features so beloved of the sport flier, while still holding the interest of the competition enthusiast? How about an event where you have to make a total time of (say) exactly 30 minutes, all landings to be on the field to qualify for flight points? In the event of a tie, the winner would be the one with the fewest flights. If there is still a tie, the next higher flight would be counted. If the scores still matched, then a fly-off flight, in the same time period (barring frequency conflict) would determine the winner(s).

Now, what about a contest with a more conventional format, but one in which luck would play less of a part while still being present to preserve the spice of uncertainty! The contest would consist of six flights, only four of which would

count to the final score. Any mix of 2-Minute Precision and 5-Minute Duration, the individual flier choosing the task after the landing, would be flown. The flight points on the 2-Minute Precision flights would be multiplied by 3, so total points would be a maximum of 400 in either task. (300 flight points, 100 landing points). There would be no penalty for landing damage, nor for flipping inverted. The reason is that the intent of this old rule, namely to discourage the "spot crash", is not, in fact, being observed. The most frequent cause of the penalty is an unlucky gust under a wing at the crucial moment. Sudden dives on the spot seldom produce an inverted landing, and most gliders have such a high strength/weight ratio that damage is also unlikely. Therefore the rule imposes a further penalty on an already unlucky flier!

A new method for reducing the luck-factor in thermal events is the "man-on-man" competition. This sounds like a good idea, but it does have one small flaw. Even though your score is in ratio with a score made by someone flying at the same time, one flier might have to fly at the same time as Mark Smith, while the other could be flying with Joe Blow from Okefenokee. In other words, there is no way to equate the score of someone who is 90% as good as Mark Smith with that of someone who is 90% as good as Joe Blow.

Also, two situations could arise. First, suppose everyone in the group decided to "piggy back" in the same area, then the better flier/glider combination should win. But suppose that one renegade decides to explore elsewhere? Either he lucks out (that taboo word again) or blows it. It doesn't make him a better or worse flier than the others in the group! Luck cannot be ruled-out of any thermal contest, but it could be averaged out (by dropping one or more of the low scores).

Personally, I don't object to the element of chance in present thermal contests, as long as I get in at least one really nice flight (or even stretch a 2 minute flight into a 5 minute flight by circling carefully in zero-sink at 20 feet altitude)! I feel the day has not been wasted. By the law of averages, everyone is going to win sometime, even if the better fliers do win more often! But if skill and reputation were all it took to win, you might just as well award the prizes by a vote of the contestants before the contest, then you wouldn't even have to hold the contest and everyone could get down to some serious fun-flying!

## TORQUE RODS — STAGE 2

from page 94

Cement the tubing in place.

(2) Slip an appropriate length of music wire into the tubing. The length of the wire depends on the distance between the servo connection and the aileron connection. Ideally, the nylon tube bearing should be long enough to hold the wire with only enough of it projecting to hold the wheel collars at each end. This prevents end-to-end shifting of the torque rod. The wire should be at least 3/32" diameter, with 1/8" music wire being used for longer torque rods. Remember, the nylon tubing may function as an internal aft wing spar — which helps keep the wing weight low.

(3) Attach the tabbed wheel collars to each end of the torque rod. Small flats may be ground or filed on the ends of the torque rod against which the wheel collar set-screws may be tightened. Since set-screw holes in wheel collars are usually threaded 4-40, small 4-40 bolts may be used to provide a "tighter" assembly. It's a good idea to sight down the torque rod and align the brass tabs to avoid building in any differential into the system (although you *can* offset the aileron tab to achieve aileron differential if you want to!).

(4) Attach servo-to-tab pushrod(s).

(5) Attach aileron pushrod(s). Note that our drawings show two different aileron horns. The first is the type we're most familiar with — an external nylon horn. The second is the type usually associated with full scale aircraft practice. To use it, the aileron must be hinged either at the top or bottom — to provide an "arm" for the pushrod to "work" on. This second type of installation is the "sexier" and eliminates wind resistance.

(6) After everything is hooked up, turn on your radio to try the system. Make sure that when you signal a right turn with the aileron stick, the right aileron comes "up" and the left one goes "down". Also, note that each aileron moves up and down an equal amount (unless you want differential ailerons — more up than down). If you see undesirable differential, take it out by loosening set-screws and realigning brass tabs.

(7) When everything works to your satisfaction, trim and round-off the ends of the brass tabs for a super-neat installation.

Admittedly, there's a bit of fussing with the Stage 2 torque rod system, but it's well worth the time and patience expended. It's applicable to all kinds of R/C models, including the scale types. Initial alignment is non-critical and it's a custom installation that's aerodynamically and mechanically efficient. □



from page 91/90

(after all, helicopters have essentially an infinite wing loading — no wing). But, based on my experience, any model in the "too heavy (?) zone will be a bear to fly.

### Speed and Time

Since we build models pretty well following the "square-cube law", gliding speed is proportional to the square root of wing loading (see above and note 2). Now, since wing loading is directly proportional to the scale of a model, this gliding speed must be proportional to the square root of the scale of the model ( $V = k\sqrt{S}$ ). This conclusion has some interesting implications. Obviously from the above, the smaller the model, the slower it should fly. But equally important, the smaller planes appear to fly faster.

The reason smaller planes appear to fly faster (and are therefore harder to fly) is because to fly scale speed, their velocity would have to be proportional to the scale of the model. To do this, wing loading would have to be proportional to the square of the scale. Let's go back to our Bonanza for an example: The full size plane flies at minimum fuel consumption at 110 mph (Its wing area is 180 sq. ft. and its weight is 3125 lbs.). Our 60 powered scale Bonanza with a wingspan of 67 inches is 1/6th scale. Thus its scale speed would be 18 mph. To fly at this speed it would have to have a wing loading of 10 oz./sq. ft. or an all-up weight of 3 lbs. We just don't build our scale models this light and, if we did, they wouldn't seem to fly right (the turns, loops, etc., would appear too tight). Actually, successful scale models pretty well follow the "square-cube law" and our scale 60 Bonanza would weigh about 14 lbs., and fly at 45 mph. This is why at air shows, where R/C models and full size planes are performing acrobatics, the models seem so much more agile.

Interestingly enough, our models take-off on about a scale runway, perform all maneuvers in about scale space, but do this all in a period of time that has been compressed by the square root of the scale of the model ( $\text{Time} = k\sqrt{S}$ ). Bob and Roland Boucher have, in several articles, elegantly described physically and mathematically this phenomena called dynamic scaling. It's just like trying to scale down a grandfather clock . . . as you reduce the pendulum length, the clock runs faster.

### Power

When we talk about model size, we generally don't discuss wing area or weight. We usually use terms like a 60 "pattern", a 19 "trainer" or a glider with an 09 power pod. So, somewhere engine size is related to model size and

expected performance.

First a digression on engine size and power: If one plots the various test data of Peter Chinn in Model Airplane News, most engines, with the exception of the small Cox's (see note 3), the racing engines and some of the newer "hot" 60's, show a direct relationship between shaft horsepower and piston displacement. As a rough approximation, if you multiply the engine displacement in cubic inches for a muffled engine by 1.7, the resultant number is the shaft horsepower. Thus a "60" has about one horsepower. It follows from this that an 09 has about twice the power of a 049; a 19, twice the power of an 09; a 40, twice the power of a 19; and a 60, about 1½ the power of a 40.

That doesn't mean that this shaft horsepower is what's delivered in terms of thrust and speed to the model. This depends on what kind of plane the engine is in, the efficiency of the prop and the actual engine RPM that's being put out in the plane's flying speed. I believe, however, that as a close approximation when scaling from one model size to another, using shaft horsepower, doesn't introduce significant errors.

Back in 1966, Chuck Cunningham proposed in an article in RCM, that the "flyability" of a model was related to the engine size, wing area and weight and proposed a formula  $F = DA/W$  (where  $F$  = flyability,  $D$  = engine displacement,  $A$  = wing area and  $W$  = model weight). Tom Stark, in a later column of Chuck's, suggested  $F = DA/W^2$  might be a better approximation. (In England, R.H. Waring in "Design Notes and Nomograms for Aeromodellers" suggested a formula of the form  $F = DA/W^3$ .) These three empirical equations suggest that perhaps there is some relationship which "will work" between engine size and the weight and wing area of a model.

What is flyability? There is no absolute criteria to use. We could define it in terms of climbing ability: a more "flyable" model would have a higher rate of climb. It could be defined in the ability of a model to perform certain acrobatic maneuvers. Or, what I choose to use, it can be defined as the ability of a model to fly at a certain multiple of its minimum level flight speed.

A typical pattern or sport R/C can fly about 3 times this minimum speed. This I choose to call "normal flyability". An engine that can haul a model through the air at this "speed" supplies about as much power as any normal R/C model needs (double this number for racing). It turns out that this required power is:  $P = k W\sqrt{W/A}$  or  $P = kW^{3/2} / A^{1/2}$  (see note 4).

Now we're really getting into those mathematical power functions I mentioned at the beginning.

Although this formula has strong theoretical backing, it really isn't too different from Tom Stark's idea 10 years ago. Tom's equation can be rearranged

in the form  $P = kW^2/A$ . Although this looks quite different from the above theoretical equation, the resultant power changes for different size models over the normal range of R/C planes is less than 25%. Power variations within a particular engine size designation are often greater than this.

To determine what  $k$  is in the equation  $F = kW^{3/2}/A^{1/2}$ , we could go through a bunch of theoretical assumptions about lift and drag and propeller efficiency. It seems easier to me to estimate this number from existing model data. Let's use an average 60 pattern ship ( $P = 1$  hp, wing area = 700 sq. in., weight = 120 oz.).  $k$  turns out to be about 0.02.

It further turns out that if we scale engine size following dynamic scaling rules (see note 5) where a model performs in scale space but in time compressed by the square root of the scale,  $P = kA^{7/4}$  which the above "flyability" equation reduces to when  $A^3$  is substituted for  $W^2$  (the "square-cube law").

### Flyability Graph

With the above conclusion on power, I've just about come to the end of my story. Since we've been using logarithmic graphs, we can add "power lines" derived from the above to Figure 6 to arrive at Figure 7 (but see note 6). I've chosen to plot engine Hp with some representative engine sizes above. This was done because the new breeds of engines coming out have significantly greater Hp than those of the same displacement a few years ago. The rather odd numbers for Hp were chosen so that each solid line is just twice the Hp of the solid line to the left and, likewise, each dashed line is twice the Hp of the dashed line to the left. Each dashed line is 1½ times the power of the solid line to its left.

We end up with a graph (Figure 7) which suggests how "easy" a model will fly based on its wing area and weight and what size power plant should be used for "normal flyability". On this graph I've plotted a few typical models. Let's use these models to see how the graph works: Suppose I want to build a 60 size Falcon that will perform similar to the 56 or Sr. Falcon. If one draws a line parallel to the diagonal lines sloping to the left from the Sr. Falcon up to the right to about 1 Hp, the suggested wing area is 1000 square inches and the suggested weight about 140 ounces. Likewise, a 40 powered Dirty Birdy should have a wing area of around 510 square inches and a weight of 82 ounces.

Or let's say we have a new 15 size engine and want to build our own design of pattern ship to fit it. The middle of the "sport and pattern" zone intersects .24 Hp (about a 15) at 300 square inches and 35 ounces. If we want a faster landing plane, the size could be reduced to 250 square inches and 34 ounces or, if we wanted more of a floater, the wing area could be increased to 370 square



inches and the weight to 38 ounces. With the exception of relative landing speed (and related windy weather performance) all three of these 15 size pattern ships should perform about the same.

Thus, with this one graph, one can: 1) approximate the size engine for a particular size model, 2) change the size of a model to fit a different engine, or 3) estimate the weight that should be aimed at for a particular type of flight performance.

Obviously, with one graph there are some limitations and rules:

(1) Our R/C models are overpowered compared to say a Cessna 150, so a particular model can generally be underpowered by 50% and still fly well. Thus, R/C trainers, especially those without throttle control, may be "easier" to fly with 50% of the recommended Hp.

(2) Because of the "square-cube law" as models get smaller, in addition to using lighter weight radio gear, the weight of the exterior skin must get lighter. Thus, there is no way we can have a planked foam wing with 10 coats of finish on a 049 pattern, though its sister 60 can carry this load with no problems.

(3) The weights shown are with R/C gear and engine but no fuel. So, to determine airframe weight, the estimated weight of the engine, tank, and R/C gear must be subtracted.

(4) Obviously low drag models can fly with smaller engines than high drag models. If a particular model flies well on a 19 where a 30 might be called for by the graph, a smaller model which might spot on the graph at a 15 engine size, would fly as well as its larger prototype on a 09 ( $30 \approx 1\frac{1}{2} \times 19$ ,  $15 \approx 1\frac{1}{2} \times 09$ ).

(5) Biplanes are a special problem. What flies well seems to have the same wing area (for say a pattern or trainer) for the engine size used as a single wing aircraft. But the weight appears to be about 20% less. With a little imagination, this can be adjusted for on the graph.

#### Notes

(1) Most of the winning contest gliders, regardless of size, have a wing loading (before ballast) of 6-8 oz./sq. ft. I believe that this is because the turning radius of a model is directly proportional to the wing loading. This 6-8 oz. wing loading will "penetrate" winds of 15-20 mph but still circle tight enough to catch the thermals near the top of the tow. A heavier glider would miss these small thermals, while a lighter one couldn't make it back to the field under many contest conditions.

(2) Wing loading and slow speed flight: At sea level  $V = 4.9\sqrt{W/A} \sqrt{1/C_L}$  where  $C_L$  is the lift coefficient,  $V$  is in mph,  $W$  is in ounces and  $A$  is in square feet ( $W/A$  is wing loading). At the most efficient flying speed (maximum lift/drag) most flying machines of any size fly at a lift coefficient of around 0.8. Therefore

$$V \approx 5.5\sqrt{W/A}$$

(3) Larry Renger of Cox has kindly given me the following approximate horsepower of the small Cox engines. Their exact magnitude may not check with Peter Chinn's tests using his standard fuels but their relative performance is what's important:

TD 01 = .025 Hp

PW 02 = .035 Hp

TD 02 = .06 Hp

Baby Bee 049 = .06 Hp

Black Widow 049 = .08 Hp

Medallion 049 = .08 Hp

TD 049 & 051 = .12 Hp

(4) The power delivered by the prop required to fly at minimum speed can be expressed as  $P_o = W \times D/L \times V$ . As an experiment in real numbers, let's assume a typical 60 pattern ship has a wing loading of 25 oz./sq. ft., a weight of 7.5 lbs. and  $D/L = .1$  ( $L/D = 10$ ). From note 2,  $V$  in mph =  $5.5\sqrt{W/A}$ . To correct to ft./sec., the constant becomes 8.07. Then,  $P_o = 7.5 \times .1 \times 8.07 \times \sqrt{25} = 30.2$  ft. lbs./sec. or .055 Hp. If we assume 50% prop efficiency, shaft  $P_o = .11$  Hp. Speed varies approximately as the cube of engine power, so the power required for "normal flyability" is about 8 times this minimum power or .88 Hp. This is pretty close to the actual value of about 1 Hp. (See Roland Boucher in *NFFS Symposium 1975* for a detailed discussion of this).

(5) (See Bob Boucher's remarks in Claude McCullough's column in the August 1975 *American Aircraft Modeler*. Bob also has an expanded version of this sent to *The Model Builder*). For dynamic scaling it can be shown that: (1)  $A = kS^2$  and (2)  $W = kS^3$ . Thus, (3)  $A = kW^{2/3}$ . If we assume constant  $L/D$  (4)  $T = kW$ , (5)  $P = TV$  and (6)  $V = k\sqrt{W/A}$ . Substituting (4) and (6) in (5) we have (7)  $P = kW\sqrt{W/A}$ . Substituting (3) in (7) gives  $P = kA^{7/4}$ . Substituting for  $A$  from (3) in (7) gives  $P = kW^{7/6}$ .

$A$  = wing area

$P$  = engine power

$T$  = engine thrust

$V$  = speed at a particular lift coefficient

$k$  = some constant which varies with units used, model type or other correction factor

$W$  = total weight

$L/D$  = lift/drag

$S$  = model scale

Note: Since we are dealing with relative values, no particular units are specified in these formulas.

(6) Roland Boucher in the 1975 *NFFS Symposium* has presented some strong evidence that engine size should be based on wing span and weight rather than wing area and weight. A similar graph can be drawn using this assumption. For practical R/C models (expowered gliders with high aspect ratio wings). I can see no significant differences between the two graphs and wing loading (wing area versus weight) more

adequately describes the "behavior" of various types of R/C models.

#### (7) Other Odds and Ends

(a) In theory and in practice  $L/D$  is not a constant but decreases with the size of the flying machine. Based on some work of John McMasters (*Tech. Soaring, Fall 1975*) and others it appears that  $L/D \approx k\sqrt{S}$ . If we plug this into the "flyability" formula, we end up with  $P = kW$ . But this implies that smaller models should have more power than what we use.

(b) I recognize that engine thrust and final power delivered by the prop at a plane's particular flying speed are not necessarily directly related. I suspect, though, that through experience we arrive at the correct propeller for a particular model so that the engine is delivering its maximum power to the plane at the plane's normal flying speed (i.e., a powered glider might be expected to have a lower pitch propeller than a pattern ship with the same engine).

(c) Although mathematically consistent, Figure 7 suggests that the new small 049 pattern ships are slightly underpowered. I believe this is because we tend to want to slow down our smaller models so we can see them easier. □

#### SAILPLANE TOW WINCH

from page 84/80

6 volt winches and truck or tractor batteries, no one much cares if they lose capacity and age rapidly from poor maintenance because they have such large capacity and the loss is not detected for some time. Furthermore, such winches are usually owned by clubs with no one responsible for its care in total. A small winch, such as I have, will probably be owned by individuals and the small batteries must be properly cared for or early loss of capacity will require very early replacement. It is critical that as much capacity be maintained for as long as possible.

Lead acid storage batteries are very touchy about two things: (1) their plates must always be covered with electrolyte, and (2) they must be kept at full charge at all times except when being discharged. Suffice to say that if any part of a plate becomes dry, it can be considered destroyed. Most people know enough to keep the battery watered with distilled water. What is more of a problem is keeping the battery charged. If the battery is not fully charged, even if only slightly undercharged, but for long periods of time, sulfation will occur and reduce the battery's capacity. On the other hand, excessive charge will "form" or corrode the plates and ruin the capacity that way. Furthermore, unlike the nickel cadmium batteries we use in our planes, the lead acid battery has con-

to page 106



## STROBEACON

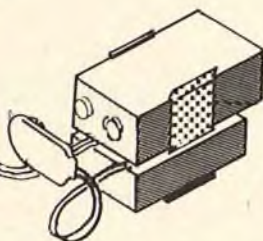


the new solid state controlled lighting system which produces brilliant light flashes visible over one-half mile. Enables dusk to dawn flying and adds realism to your aircraft. A 9V alkaline battery lasts all season. Wt 1oz.

# \$17.76



Red and Green wing  
light kit- \$8.55



Postpaid. Batteries not supplied.  
Complete information sheet \$.25

**DESTEK**  
INDUSTRIES

P.O. BOX 24163  
Los Angeles, CA 90024

### ATTENTION R/C MODELER SUBSCRIBERS

If you're moving, want to write us about your subscription, or have missed an issue, fill out this form, attach your old mailing label, and mail to RCM.

Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_  
State \_\_\_\_\_  
Zip \_\_\_\_\_

PRINT YOUR NEW ADDRESS HERE

ATTACH YOUR MAILING LABEL OR  
PRINT YOUR OLD ADDRESS HERE

R/C MODELER MAGAZINE  
P.O. Box 487, Sierra Madre, Calif. 91024

## SAILPLANE TOW WINCH

from page 103/80

siderable internal impedance and can be charged too fast and be damaged, particularly near the end of its charge. Because of this internal impedance, the cell can be discharged too rapidly and should not be completely discharged. I have actually seen the small battery in the first winch *boil* when over-discharged. The battery will give you adequate warning when it is getting low. When you notice it is getting weak, don't launch any more. Reel it in and go home. It is also no fun to get that "one last flight" only to find that the battery is completely dead and will not wind in the thousand feet of line laying on the field as it is getting dark!

To be safe, when returning from flying, you should follow these steps in caring for your battery: Charge it at about 1/10th of its amp hour capacity for however long it takes to fully charge it. The smaller battery has a 14 amp hour capacity and should be charged at about 1.4 amps. It will require 110% of the capacity of the battery to fully charge since there is a 10% charging loss. Therefore, it will take no longer than 11 hours to charge the battery from flat. Many chargers will reduce the amount of current at about 85% of full charge as the battery voltage rises. This is a good clue that the battery is nearing full charge. Also, about this time, the cells will start to gas (bubble) where they did not before. It is also about this time, that if you measure the battery's specific gravity it will suddenly rise rapidly. It is okay to charge for an hour or two once this point is reached. The larger battery's capacity is not stated, but I calculate it to be about 35 amp hours and could therefore be charged at 3.5 amps safely. You may charge the battery faster if it is well discharged and if the cell temperature does not exceed 110 degrees F., but when the cell starts to gas, you must promptly decrease the charge. If your charger delivers too much current, you can reduce it by getting a 10 watt resistor with a resistance of from 2 to 10 ohms (4 is a good place to start) and place it in series with the battery and charger. There are automatic battery chargers on the market that can be used, but be sure that they are the definite "two stage" type, and not the "tapering" type which is not automatic at all.

Once the battery is charged, one is still confronted with the problem of keeping it charged. It will gradually discharge if allowed to sit idle (like all winter perhaps?). Occasional recharges are required, but then you need to know how much charge to return. Specific gravity readings are not of much help here because small differences in charge will be

masked by the effect of temperature and the exact amount of water that is in the battery. Frankly, the best way to keep the battery in top shape is to connect it to a floating charger and leave it on. A floating charger is easily constructed, costs very little, and rapidly pays for itself in ease of battery care and saved battery capacity.

A lead acid battery's voltage is very dependent on the state of charge. Therefore, if we connect a charger to the battery that has the same voltage as a fully charged battery, the charger will not deliver any current and will not charge the battery. As the battery begins to slowly discharge while sitting idle, its voltage will drop slightly. The charger's voltage is now slightly higher and it will deliver a small charge and bring the battery back up to full charge. It will not over-charge, and it will not allow discharge . . . perfect. Furthermore, it need only be connected and left on the battery at all times. No further attention is required. It will not cause the battery to gas either, so frequent watering is not required.

Such a charger is easily made by going to a store such as Radio Shack and buying a 12.6 volt transformer. While you are there, get a diode (or full wave bridge diode), some type of connectors to attach to your battery, and some small two conductor wire such as "speaker wire" or lamp cord.

The battery should be maintained at about 13 volts (2.16 volts per cell). A 12.6 VAC transformer develops a peak voltage of 17.64 volts DC when rectified. You actually need a transformer with a voltage of 9.29 VAC. You can get that voltage by regulating the transformer or by taking off some windings. Taking off windings is easy, so do it by first taking the transformer core out of the windings. Radio Shack transformers are easy to work with this way. They have a plastic form that all the windings are on and the core may be removed with the windings intact. The core is removed by first prying off the channel iron that goes around the core after first lifting the ears that hold it in place on the bottom of the transformer. This will come off in one piece and unbend except at the corners where you spread it. The core has a clear paint on it that reduces eddy currents in the core and tends to stick everything together. You will have to work with a small knife and a small screwdriver to slide the laminations over each other . . . you can only get one out at a time because every other one goes in opposite directions. Now that you have the windings out of the core, carefully unwrap the tape and start to unwind the secondary winding (it will be on top). Try not to damage the leads coming from the primary winding underneath. Count the secondary windings as you remove them (there will be around 120 turns). You now need only return 74% of the windings and you are

to page 108

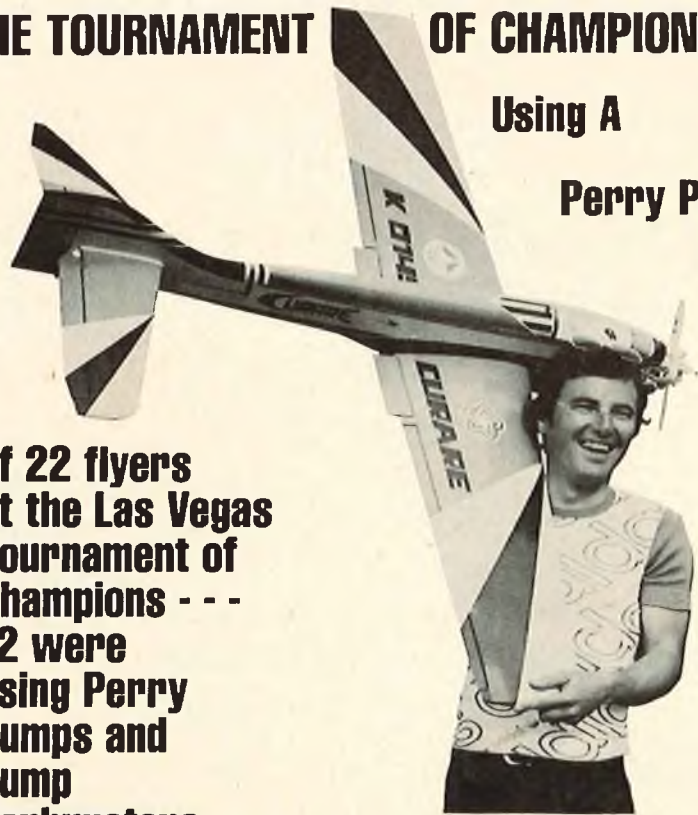


# HANNO PRETTNER DOES IT AGAIN!

## 1ST PLACE WIN AT

### THE TOURNAMENT OF CHAMPIONS

#### Using A



of 22 flyers  
at the Las Vegas  
Tournament of  
Champions - - -  
12 were  
using Perry  
Pumps and  
Pump  
Carburetors

#### Perry Pump

## YOU, TOO, CAN WIN WITH PERRY!

**PERRY AEROMOTIVE, INC.**  
581 N. Twin Oaks Valley Road  
San Marcos, Calif. 92069 • Phone: (714) 744-0841

#### SAILPLANE TOW WINCH

from page 106/80

in business. If you have a 12 VAC transformer, then you need to return about 78% of the windings and you are in business. If you have a 12 VAC transformer, then you need to return about 78% of the windings. Therefore, if you started with a 12.6 volt transformer and it had 120 turns on the secondary that you unwound, then returning 89 turns would be right. Now return 6 more turns to compensate for the voltage loss through the diode you will install and put the core back together. Don't worry about painting it. It will run a bit warmer, but it will not matter. Incidentally, the transformer need not be large, 300ma is adequate, although you may find 1.2 amp units easier to work with.

Solder the diode on one of the transformer leads either way. The end with the ring on it will be positive. If the ring is facing away from the transformer, then that lead is positive and the other is negative, and visa versa. If you use one of the full wave bridges (preferred) one lead of the four will be marked +. If they are in a line, the leads marked "AC" are where the transformer leads attach and the one marked + will be positive and last one will be negative. If the leads come out of each corner of a square, the negative lead is diagonally across from the positive one and the transformer is connected to the remaining two leads. All that is now required is to connect the wire to the appropriate leads and connect the positive lead to the positive terminal of the battery and the negative to the negative battery terminal. Don't connect them backwards, as you will ruin your charger.

I must admit that this little charger is made for normal room temperatures. Batteries require different charge levels and voltages as the temperature changes. Even so, this charger is better than nothing. Remember that this is a float charger and that it will not do a very fast job of charging a dead battery, probably requiring months to do the job. Use your regular battery charger, as this one will only deliver 1/10th of an amp at most.


#### The Turn-Around Pulley

I purposely left this until last. I felt that the usual turn-around pulley made from a bicycle wheel hub is atrocious. It has far too much mass and inertia as proved by observation of well used pulleys and seeing the deep grooves cut in them from where the line has been forced to slide while the hub was getting up to speed. Add to this the fact that the width is far too much, the diameter is far too small, it is too heavy, the bearings are poor, the hubs are not round or concentric.

to page 112

### WE'RE FIGHTING FOR YOUR LIFE

# Exercise Regularly

American Heart Association 





## THESE TWO ELECTRONIC THROTTLES GIVE FULL SPEED CONTROL OF YOUR ELECTRIC MODEL...

These are the world's most advanced solid-state motor speed controls for electric-powered cars, boats, planes. They eliminate servos, cumbersome rheostats and micro-switches. Plug into receiver throttle connector. Unique "Unidrive" circuitry.

\*Pat. pend.



### Electronic Throttle Model ET-3

Model ET-3 is the highest efficiency, fully proportional forward speed control. Controls Astroflight 02 thru 25, Dumas and Kroker motors and others rated 4.8-36V, 20 amps max. Works with positive or negative pulse receivers. No adjustments required. Extends flight time by as much as 300%. Same size and weight as a servo.

Price \$39.95



### Reversing Electronic Throttle Model RET-4

Gives fully proportional forward and reverse control from only one channel. Controls Astroflight 05 & 10, Dumas, Vantec IM-4 and others rated 3.6-12VDC, 10 amps max. Compatible with all 1/12-scale electric cars.

Price \$56.95

**NO RISK 21-day trial.** If you are not **COMPLETELY SATISFIED**, we will immediately **BUY BACK** any items you purchase! Send check, money order or C.O.D. We pay postage. Or call our order taker right now: (213) 780-3020.

Send me my:

☐ ET-3 \$39.95 ☐ RET-4 \$56.95

I enclose \$\_\_\_\_\_

(Calif. res. add 6%)

NAME \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_

ZIP \_\_\_\_\_

MOTOR \_\_\_\_\_

R/C EQUIP \_\_\_\_\_

**VANTEC**

443 S. Oakhurst Dr.  
Beverly Hills, CA 90212

## SAILPLANE TOW WINCH

from page 108/80

tric, and they are physically much too large and you can see why I was dissatisfied with them. I quickly discovered why they are so widely used however: They are readily available and easy to make... and they do work okay. My turn-around pulley required more engineering, was more difficult to make than my winch, and required more time to build than the winch. With that in mind, you may wish to construct one of the turn-around pulleys demonstrated in RCM by Joseph Elgin.

The main problem with turn-around pulleys is that they must not allow the line to come off the pulley or get tangled in any conceivable circumstance. To accomplish this in my design, the main pul-

ley is housed within a separate housing that prevents the line from riding up and over the edge of the pulley. The diameter of the pulley is large enough that there is absolutely no line slip. The unit is made of plexiglas and is very light. Twin ball bearing races are used on the pulley. The whole unit is small, light, and performs flawlessly. Making it is an exercise in precision lathe work, but if you are up to it, the results are well worth the effort. When tying up the pulley, leave plenty of slack in the rope so that the pulley may freely track the tow line. When winding in the line under low tension, you will find that the line will touch the edges of the housing and burn very small grooves in it. This can be prevented with steel edges, but it is not necessary. The line will cut a few grooves and then it will follow those from then on without causing any further erosion. □

from page 79/78

that's it folks. To use, drop the box in place, stretch a couple of strong elastic bands over it, attached to the hooks, and it is ready to go. What's that — elastic bands doesn't sound very serious? Okay, so you find a better system — and when you do, let us all know about it. This is the one I have been using for the last five yers, I do a lot of endurance racing, and I have **never** had a radio box come loose yet! Quite honestly, I agree with you, it doesn't sound very serious — but it works, and that's what matters.

The rest is plain sailing. Connect the lead-outs to the rudder and the throttle, using your favorite method. I always use bicycle spokes, because the thread happens to be the same as that used in the Kavan Quick-Links, and they are cheap, you can buy a fistful for a dollar.

But hold on, we've forgotten something — or rather, I have. I said attach the to page 114

**IMPACT**

## Safety Shear Rudder Assembly

Now available, after three years of testing and development, a precision die cast aluminum Safety Shear Rudder Blade Assembly for .40 and .60 class boats.

**SS Rudder Assembly complete ..... \$12.95**

includes: Safety Shear Rudder Blade, Shear Pin, Shear Pin Retainer, Control Arm, Pivot Pin, Pivot Bracket, Mounting Plate, extra Shear Pins and extra Shear Pin Retainers. All seven component parts can be purchased separately. **SS Rudder Blade only ..... \$7.95**

may be used in Marine Specialties HBR and 2/3AR Rudder Assemblies.

P.O. BOX 588 SARATOGA, CALIFORNIA 95070

CATALOG \$1.00

FULLY GUARANTEED

DEALER INQUIRES INVITED



FAST BUILDING • EXCELLENT TRAINER <sup>A<sub>0</sub></sup> SPORT PLANE

# SOLO

SOLUTION AEROMODEL COMPANY  
2258 WYOMING N.E.  
ALBUQUERQUE N.M. 87112  
505-299-3016



**\$41.95**

A Trainer and Sport Model Designed for  
Radio Controlled Flying. Length 41", Span  
51", Wing Area 523 Sq. In., Weight 3.5 to  
4.5 lbs. Radio, Four Channel, Engine 20 to  
.49. Wing Section Full Symmetrical.



## FREE SAMPLE

### "Pin Clamps"

Try 'em, you'll want more!

Send this ad with a self  
addressed stamped envelope to:

## ROCKET CITY SPECIALTIES

103 Wholesale Ave. N.E.

Huntsville, Ala. 35811

RCM

## NEW

NOW INSTALL THE FINEST

## NEW

### PUSH RODS

Into That Ship That You've Put The Best  
— Of Everything Else Into —

- ★ SPRING TEMPERED STAINLESS STEEL
- ★ SURGICAL GRADE, POLISHED SURFACE
- ★ CORROSION AND RUST PROOF
- ★ TRUE 1/16" DIAMETER (.0625)
- ★ EXCELLENT SOLDERING QUALITIES
- ★ MANY OTHER USES: STRUTS, LANDING GEAR, ETC.

PACKAGE INCLUDES 8 LENGTHS

2 Each: 36", 30", 24", 18" PLUS 8 threaded couplers  
LONGER CUSTOM LENGTHS AVAILABLE UPON REQUEST

**RUSH \$3.49 + .75 Post. & Hand. RUSH**

### WYTECHIND. INC.

555 VALLEY ROAD  
WEST ORANGE — NEW JERSEY 07052  
201-325-2888

New Jersey Res.  
Include 5% Sales Tax

Dealer Inquiries  
Invited

## CANADIANS



FOR

Fast, Efficient, Economical MAIL ORDER  
service of all your AEROMODELING Supplies,  
WRITE

CALGARY HOBBY SUPPLY LIMITED  
Box 3173, Stn. B., Calgary, Alberta

DEALER INQUIRIES invited for Du-Bro, Sullivan,  
Swanson, Franklin, K & B, Webra, Perfect Paint,  
Superstrong Covering, RDM Balsa, Kraft, Soarcraft.

Store Address: 3920 Edmonton Trail N.E.,  
Calgary, Alberta. Phone: 277-4664.

Headquarters for

Send for brochure

## SCHOOLYARD SCALE

Kinner "Sportster"



39" wingspan, .049 power  
up to 3 channels r/c — \$12.95

Stearman C.38



35" span, .049 power  
up to 3 channels r/c —  
\$13.95

COMING SOON!

Fairchild "22"



48" span  
.09 to .25 power  
3-4 channels r/c —  
price to be announced

other kits also available

these are some of the finest  
models available in the world  
today for the price



## FLYLINE MODELS

SEE YOUR  
HOBBY DEALER

10613 ASHBY PL. FAIRFAX, VA. 22030  
Tel. (703) 273-9593

## WINNING

Model & Hobby Supplies

2A, Austin Ave.,  
Kowloon, HONG KONG.

Tel. 3-684184

10:00 AM — 7:00 PM  
(Monday — Saturday)

R/C Model Airplanes, Soarers,  
Helicopters, Cars, Motorcycles,  
Tanks, Boats, Yachts,  
Accessories Etc.

\*1976 NEWS\*

### WINNING HK BRANCH

already opened

34-36, Yik Yam St., B1,

Happy Valley, H.K.

Tel. H-753493

Price List-US\$ 1, by Air.

## POWER BOATING

from page 112/78

lead-out to the rudder, but I should have said to the tiller, and that is something we haven't considered. Well, again, I always make mine, because it is not much of a job. You can buy them, but I find I get more satisfaction from making certain things myself. Mind you, I have nothing against ready-made items, and with time at a premium, I use a lot. But there is no getting away from the fact that, now and again, it leaves a nice feeling when you make something yourself that you could



Commercial nylon tiller arm above,  
home-made aluminum unit below.

have bought. I make tillers this way: I buy, or more usually confiscate, from one of my students — a square aluminum ruler. This has a cross-section 10mm square, and is ideal, but any piece of metal of similar dimension is fine. Then I cut it up with a hack-saw, as per the diagram. See Figure 3.

This is self-evident. Hole A is 3mm, and takes the bolt which will pinch the tiller onto the rudder shaft. Hole B is drilled according to the size of your rudder shaft, and the other small holes in the arm are the same size as the pin in a Quick-Link. Make sure you get these holes the right size, or there will be some play. A couple of years ago I had an endurance boat, with my trusty old Rossi Speed 60 in it, which always caused howls of laughter whenever it was moving fast. I had drilled the holes in the tiller arm too big, there was some play, and the stern of the boat used to shimmy better than Fanny Fox, at speed! So make sure they are the right size. In fact, Electronic Developments, England, do make an identical tiller, in two sizes, in plastic, and these are very good.

Let's now review the situation. We have the hull, with engine and shaft in place, the bulkheads, water cooling gear, steering, tank and radio. It looks as though it is time for the deck to go on. But no, it isn't. There's something missing, and that something is floatability. Let me tell you a story (another!) I and a friend who built a Tornado racing boat, complete with a new Rossi 60 ABC and a Graupner 6-channel radio. He was boat mad, but a beginner, and he just couldn't wait to try that boat out. I told him to put some expanded foam in it, but no, he



couldn't wait. He loaded everything into the car, and off he went, to a big artificial lake, some twenty miles away. He fired up the Rossi, checked the radio, and let go. Off it went, and for ten minutes ran around nicely, breaking in the engine. But Jean couldn't wait any longer — he opened it up. It took off like a scalded cat, and turned over. Now, in case you didn't know, glass-fibre is heavier than water, and his boat said "Glub, glub, glub", and disappeared. We got the local diving club in, but the bottom of that lake is thick mud, and we never did find that boat. As far as I know, a good hull, expensive Rossi, and even more expensive Graupner radio are still down there somewhere, in the mud! Well, for the sake of a couple of cents-worth of expanded polystyrene, and five minutes of time, the profitability on that episode was rather negative.



**Class A Mini-Jaguar hull showing foam filling, trimmed to take deck.**

One way of making sure that the same thing doesn't happen to you is to fill all the spare spaces in the hull with pieces of expanded polystyrene foam. This is fine, but a bit untidy. A better way is to buy a two-part mix, and build longitudinal bulkheads into the hull. This way you should end up with five separate compartments — with the added advantage that this makes the hull more rigid. Pour the foam into the separate compartments, and then trim off the excess, when it is hard, with a sharp knife, or a small saw. The advantage of the second method is that there are no empty spaces for the water to get into.

A word of warning: Some people say that you should put the deck on, then drill holes and pour the liquid in. This means that there is some slight pressure, and every last corner is filled. True, but I have seen a boat treated in this way (one of mine, actually!) left out in the strong sun. Whether it was the effect of the heat, or what, the foam started expanding again, and the deck parted company with the hull! This does not appear to happen if the foam is allowed to expand to its limit initially. You can see from the photo what it looks like, before the deck is fitted.

Whoa! Put that deck down — you haven't finished yet. There is something else — the aerial. With all that foam, you have got to fit the aerial to the deck and

**O.K. so you've built your own RC car, boat and airplane.**

**Now you're ready  
for the  
ultimate thrill.**

## MOVE UP TO AN RC HELI

RC Heli's aren't merely the newest hobby for the radio controlled vehicle hobbyist. They're merely the most challenging, exciting and rewarding experience of all. There's nothing quite like being in command of your own Heli. As it hovers, moves up, down, flies at your command. Yes, it takes a new measure of skill, because it's unlike anything you've ever flown before.

Get started right. Come to where you can find the most models . . . and get the most reliable and expert advice. We've built them all . . . We've flown them all.



**S.C. MODELER  
HOBBY SHOP**

Helicopters, Planes, Cars, Boats, Radios,  
Parts for RC Hobbyists

1999 Larkin Avenue, Elgin, Illinois 60120  
Dept. 117 312-697-3737

### KRAFT ORANGE COUNTY AUTHORIZED SERVICE CENTER

also Tower Radios West warranty service and KSE and KGL repairs.

Contact: George Killeen (714) 630-5061  
2817 East Lincoln Ave., Anaheim, Calif. 92806

Also at same Address:

#### MOSES RC ELECTRONICS — WARRANTY SERVICE

on Mathes and RS Systems units. Authorized service on Cannon radios.

Expert repair on most other brands.

#### McCARTHY'S R.C. SERVICE — ACE WARRANTY SERVICE

Authorized service for Orbit. Expert repair of Heathkit and Micro-Avionics units.

**FACTORY TRAINED TECHNICIANS — ALL WORK GUARANTEED**

## D & S MODELS FIBREGLASS RICKEY RAT

At Last By  
Popular Demand —  
A 2-Piece  
Rickey Rat

Quarter Midget World Records  
1976 Short Course 1:24:0  
1976 Nationals Long Course  
1:35:1 set by Tom Christopher



1976 FI & NMPRA  
Championships  
Fast time 1:15:0  
by Steve Sica

D & S MODELS, 4080 Orange Avenue  
San Diego, Calif. 92105 (714) 281-6850

#### FEATURING:

- EPOXY FUSELAGE
- FIREWALL
- GLASS CHEEK COWL
- GLASS WHEEL PANTS
- RACING WHEELS
- DURAL LANDING GEAR
- AXLE & LOCKING NUT
- CUT WOOD TAIL SECTION
- FOAM WING CORE
- WING SKINS
- TORQUE RODS
- CANOPY
- PLANS & INSTRUCTIONS

#### SPECIAL PRICES:

Form I ..... \$65.00  
(specify 1 or 2 piece when ordering)  
1/4 Midget ..... \$45.00  
(1 piece only)

#### IN NEW HAMPSHIRE . . .

Your complete R/C Center is Fitts Photo and  
Hobby Shop, Kings Hwy Plaza - Route 108  
Stratham, N.H. (603) 778-8802. Open weekdays  
10-9, Sundays 1-6. Kraft MRC EK Enya  
OS Max Fox Kits and accessories.  
We fly ourselves.

#### TEMPLATES



DEALERS WANTED

**SEE  
TEMP**

New improved. Won't crack or shatter.  
Easiest and most accurate way to make  
Templates. Rigid, will not twist or dis-  
tort. Can be cut with modeling knife or  
scissors. Exact templates are made by  
scoring plastic right over the plans with  
modeling knife. The template is easily  
broken out after this and the plans are  
saved. No Glare Plastic Sheet is 20" by  
50" by .015. Label and trace templates  
with ballpoint pen or pencil. \$3.95 per  
sheet, two sheets for \$7.00 ppd. Send  
check or money order please.

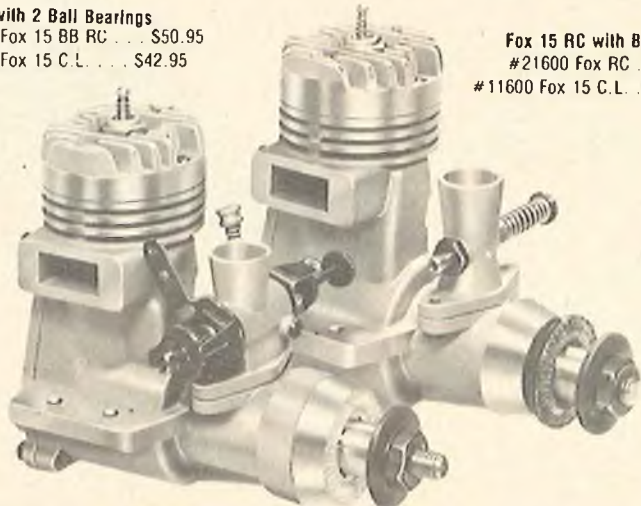
P.O. BOX 670, MENOMONIE FALLS, WI. 53051



# FOX 15 Schneurle Now Available!

**Fox 15 with 2 Ball Bearings**  
#21698 Fox 15 BB RC . . . \$50.95  
#11698 Fox 15 C.L. . . . \$42.95

**Fox 15 RC with Bronze Main**  
#21600 Fox RC . . . \$32.95  
#11600 Fox 15 C.L. . . . \$24.95



## The New Fox 15 BRINGS A NEW STANDARD OF PERFORMANCE WITHIN REACH OF THE SPORT MODELER

**Easy Starting:** The new Fox 15 does not have to be flipped like a pro or primed just right. It starts easily for beginner or expert - hot or cold.

**Power:** Easily the most powerful side exhaust 15 you can buy - and closely approaches the power of the leading rear exhaust full racing motors.

**Long Life:** With Fox Fuel and reasonably clean flying conditions you can expect on the order of 100 hours of happy, trouble-free flying.

**Reliability:** The New Fox 15 has the remarkable ability to swallow an air bubble in the fuel line; accept an over lean or over rich setting; or a fuel surge resulting from a violent maneuver and still continue running.

**Crash Resistant:** It will really take a hard one on concrete to ruin the new Fox 15. Prop stud is re-

placeable at modest cost. So are carb parts or complete carb.

**Choice of Muffler:** If, like most modelers these days, you must keep your airplane as quiet as possible. The Fox 15 Conventional Muffler is compact and efficient at \$5.95. If your airplane can be fitted with our 15 size tuned pipe, you can have both quiet and more power.

**Service:** The best laid plans of mice and modelers seem to occasionally come crashing down. And when this happens, you really appreciate owning a Fox. For parts call 501-646-1656 and the parts will be on their way within 24 hours. Complete re-builds are now running three days. Also it is reassuring to know your repair will not cost more than your motor is worth. (Maximum repair charge will never exceed 60% of a new motor plus shipping.)

### CONSTRUCTION FEATURES

- Patented Crankcase - Super Sturdy
- SAE 660 Cast Bronze Main (Bushing Model)
- Interchangeable from C.L. to R.C. by merely bolting on another carburetor.
- Replaceable Prop Stud
- Special 10 mm Ball Bearings (Ball Bearing Models)

### OPTIONAL EQUIPMENT AVAILABLE:

Conventional Silencer #90213 . . . \$5.05  
Tuned Pipe Silencer #90310 . . . \$15.95  
Intake assem for Pen Bladder #11620 . . . \$6.00  
Large Throat Carburetor #21750 . . . \$12.00

## Fox Manufacturing

**Fox Model Airplane Products**  
5305 Towson  
Fort Smith, Arkansas 72901  
Phone 501-646-1656

carve a passage for the wire from it to the radio-box. But before fitting the aerial, you have to decide on what to use. For a long time I used a banana plug, with a length of music wire soldered into it. I used this until the day it cost me a new cylinder and piston for the Rossi! Due to vibration, the plug jumped out of the socket, and the boat went out of range, ran up the bank of the lake in an inaccessible place, and did a terrible shaft-



*Racing Models whip antenna and base. Note coaxial cable for connection to radio box jack.*

run. Since then I have been using Stidwill's aerials in my boats, and have had no trouble. He makes the wire from the aerial base to the plug for the box from TV co-ax cable, and solders both inner and outer wires together, making a very strong job. The only modification is to put a lock-washer between the aerial and its base, before screwing it in place. Then it just won't jump out or come unscrewed.

Okay, so now go ahead, stick that deck in place.



*Layout of Octura Wildcat hull, now under construction.*

I have to say thank you to Tom Perzentka of Octura, who has sent me a Wildcat tunnel hull to try out, complete with accessories. I intend to build this model, and talk about it from time to time in this column, in case the information may be of interest to any of you. We'll take a look at that next time.

At the time of writing I am busy sorting out the three boats I shall be using in the World Championship Endurance races in Johannesburg, South Africa, this summer, and by the time you get to read this, it will be about over. I'll be running a report on that event, that may be of help to you, since I shall be looking particularly at the technical side of the competitive machines.

See you again next month? ☐



## ORANGE BLOSSOM HOBBIES, INC. EN MIAMI, FLORIDA

La tienda de hobbies mas grande y completa del Sureste de los Estados Unidos. Situados a solamente 8 minutos del Aeropuerto Internacional y del centro de la Ciudad. Tenemos el mejor surtido de repuestos y equipos de Control Remoto para lanchas de motor, veleros, autos y aviones. Trenes electricos, autoramas y de todos los tipos de modelos plasticos y de madera. Bienvenidos amigos latinos. Aqui hablamos su idioma.

**1975 N.W. 36th ST.**  
**MIAMI, FLORIDA 33142**  
**TEL. 305 / 633-2521**

Aceptamos:







## NATIONAL SOARING SOCIETY

The largest and most active organization for soaring enthusiasts operates under a set of written Constitution and Bylaws and is run by modelers for modelers. We invite you to join a fraternity of soaring pilots.

**REQUEST APPLICATION FROM**  
**Dr. Stan Pfost**  
**1481 Howell Branch**  
**Winter Park, Florida 32789**

**60  
TO  
GO**

### PROFESSIONAL HAND CRAFTED MODELS

Now available, professionally built models of quality balsa, plywood and superlight sheeted foam wing cores. These planes are individually hand-crafted in the tradition of old world craftsmanship. Just assemble components, finish, add your own hardware and gear and go at a price you won't believe. Models available are  
**MACH 1 (60) PHEONIX 6 (60) SUPER KAOS (60)**  
other designs available soon



60 TO GO LOGICROL CANADA LTD.  
IN USA: BOX 12, HOYLE'S, MINNESOTA, ZIP CODE 56740  
IN CANADA: 200 BANNERMAN AVE., WINNIPEG  
MANITOBA, CANADA R2W 0T4  
phone 1-204-582-1154  
distributor and dealer inquiries invited

PUT YOURSELF IN COMMAND OF THE  
SPORTY TIGER CAT, YOU'LL BE  
DELIGHTED WITH THE PLEASURABLE  
EXCITEMENT IT GENERATES.

DEALER & DISTRIBUTOR  
INQUIRIES INVITED



**\$54.50**

**TIGER CAT**



**'VAGA'**  
• SPECS •

WINGSPAN: 56"  
WING AREA: 520 Sq"  
WEIGHT: 5 to 5½ Lbs  
ENGINE: 29-46 DISP

FOR PREPARED BROCHURE  
SEND 25¢ NO CHECKS PLEASE

• SPECS •  
WINGSPAN: 38"  
WING AREA: 600 Sq"  
ENGINES: 35 to 46 DISP  
INTERLOCK ASSEMBLY  
ALL Balsa CONSTRUCTION

**MACO**  
MODEL AIRCRAFT INC.

694 Shadow Wood Lane, Webster, N.Y. 14580

### MISS AMERICA

from page 77

..... parts  
fit perfectly. We would recommend replacing the mahogany plywood with aviation grade plywood for extra strength.

In the flight performance category, our prototype balanced slightly ahead of the recommended Center of Gravity due to the .15 size engine, muffler and 4 ounce fuel tank, and flew quite well at that location. This plane is an extremely steady and stable flyer with no tendency to snap. This could, perhaps, be attributed to the 1/4" washout at each wing tip. This is an excellent sport aircraft, and also an excellent trainer for the novice. The .15 is, perhaps, too much power but, when you want distance between your plane and the ground, the .15 puts her way up there. This is the fourth Micro Models Miss America kit we have built and each has proved to be an outstanding aircraft with excellent flight characteristics. An excellent buy at \$27.95. □

### EARLYBIRD BIPE

from page 68/64

ter and be sure you have 3/8"-5/8" up and down throw (or more) with conventional ailerons (which may require a fairly long servo arm or large output wheel on some servos.) Strip ailerons need only 1/4"-3/8" throw.

Remove the servos and sand the wing carefully, removing as much as necessary to achieve the proper shape and no more. Lightly sand with fine sandpaper to receive the covering. It's often easier to wait for hinging surfaces (ailerons) until covering is completed, but everybody has their own favorite method. If you don't have a favorite method, ask someone if you can use theirs.

Fiberglass or nylon reinforcement epoxied over the center section and where the rubber bands contact the leading and trailing edges of the wings will prevent the rubber bands from cutting into the wing structure.

### FINISH

Cover and finish to your own taste. This is sort of a cop-out, but we do recommend an iron-on, such as Permagloss Coverite for that antique look. The stab and fin may be covered prior to assembly but keep the covering and finish off of the parts to be glued together so that your glue will stick. Coat the inside of the tank compartment with epoxy for strength and to prevent fuel soaking. The open structure may be brushed or sprayed with epoxy, urethane varnish, or dope, but keep it off the wheel sides if you plan to use an iron-on cover there.

to page 120



# NOW IT'S OUTBOARDS!

... and K & B takes  
the LEAD into a New Field



## The First Annual GOLDEN GATE OUTBOARD REGATTA...

held on November 7th at Spreckles Lake in Golden State Park, San Francisco, proved so successful it is to be an annual event.

Modelers from eight clubs throughout California competed, ALL using the K & B 3.5cc outboard model engine. The event, designed for outboard competition, is credited to Mr. Jay Selby of Redwood City, California. He is recognized as the leading exponent of outboard racing. It was through his initiative that the San Francisco Model Yacht Club agreed to host the event.

### WITH EACH CONTESTANT COMPETING IN FOUR HEATS...

the results were:

**THE WINNER:** Judy Prigley, Fremont, Calif.  
Member of the Marine Modelers of Santa Clara.

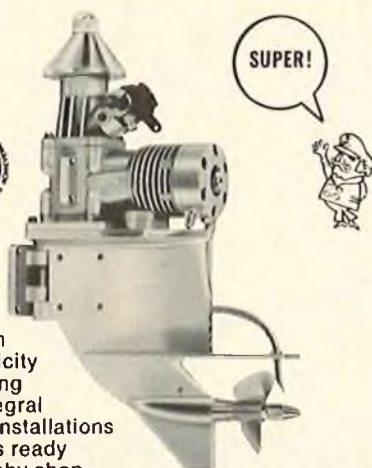
The boat — a Klampon Kai, Engine K&B 3.5cc (.21)

Fuel — K&B Speed Fuel Glow Plug — K&B  
3 Firsts 1 Second

**SECOND PLACE:** Pat Pottol, Saratoga, Calif.  
Member of the Saratoga Over The Hill Racing Team. 3 Firsts 1 Third

**THIRD PLACE:** Dick Norskian, Arleta, Calif.  
Member of the Modelers of San Fernando Valley. 3 Firsts 1 Non Finish

The K&B Outboard 3.5cc opens up a new concept in R/C boating to all model boat enthusiasts. Its simplicity of operation — unit incorporates power plant, steering mechanism, water pick-up, and propeller in one integral unit — makes it easy for everyone. No complicated installations... a simple 4-bolt mounting and your power plant is ready to go. See the K&B 3.5cc Outboard at your local hobby shop.



SUPER!

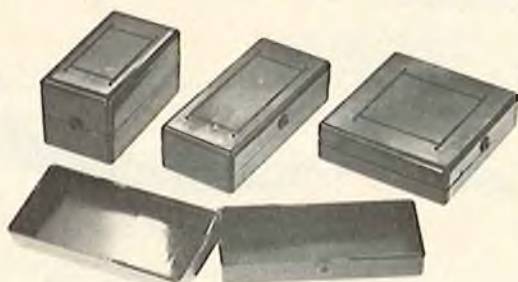


Send for your K & B Catalog, "Matched Finish System" Handbook and Super Pox Paint Chart. Include 25c to cover postage and handling. Address to Dept. SR-2



**K & B  
MANUFACTURING**

DIVISION OF AURORA PRODUCTS CORP.  
12152 WOODRUFF AVE., DOWNEY, CA. 90241



### DUNHAM'S R & R

P.O. Box 34002

1100 N. Lake Havasu Ave., Suite 1  
Lake Havasu City, Arizona 86403

### DUNHAM'S E Z CHECK BATTERY CASE

An electrical check is not sufficient, batteries should be inspected visually also. Specially designed case for quick, easy, inspection of your nicad battery. Catch corroded cells, weak or broken connections and pinched wires before they cause a crash. Easy to install. Not necessary to remove wires or connectors from your present cells. Available in sq. or flat type for 500 ma cells, flat type for 450 ma cells.

**Guaranteed, even for crash damage.** PRICE: \$1.95

### EARLYBIRD BIPE

from page 118/64

Some have covered the open structure with clear MonoKote which keeps the structure clean without detracting much from the old time look.

### FINAL ASSEMBLY

Glue the stab to the fuselage and check the alignment carefully, ensuring that the vertical fin is straight with the center of the fuselage.

The tail skid bearing is wrapped with string and epoxied to the tail. Insert the tail skid strut through the bearing at the tail; bend aft on top to fit the hole drilled in the leading edge of the rudder so that the rudder horn will hold the aft-extending wire for steering. You may use a tail wheel or a plywood skid which looks better and steers fine on the ground. Install the rudder using hinges carefully notched into the surfaces with toothpicks inserted into a hole drilled right through the balsa and hinge material to hold securely. Or, simply use epoxy to anchor the hinges, but keep the epoxy out of the tiny space between the surfaces so that the controls will move easily. When dry, ensure that the rudder and steerable tail skid work smoothly with no slop or binding, then slip a washer over the bottom of the strut, up to the bottom of the bearing and solder carefully in place.

Using the same procedure as on the rudder, install the elevator and aileron hinges. Install hardwood or plywood servo rails to fit your particular servo tray, then install your servos and hook up the Sullivan pushrods to the servos and to the rudder and elevator horns. Fasten the horns to the rudder and elevator — again ensuring that all controls work smoothly with no binding or slop. Do the same with the aileron linkage. If your controls don't work perfectly, fix the problem now. You should have 1/2" throw, or more, on the ailerons and rudder; about 3/8" on the elevator each way.

The landing gear is bent from 5/32" wire and strapped to the ply fuselage bottom with rubber bands around the dowels as shown on the plans. Install the engine using a radial mount, such as a Kraft or Midwest, and stuff your receiver and batteries — well padded with foam rubber — into the appropriate holes. I like to slip plastic freezer bags over the receiver and the batteries, securing them, where the wires come out, with rubber bands. Install your fuel tank and associated necessary "plumbing". Finally, install the wheels.

### NOW STOP!

Before we wind up (and for those of you who read only the beginning and the end of articles) let's try a famous admon-

to page 126



# R/C Air Boat/Amphibian

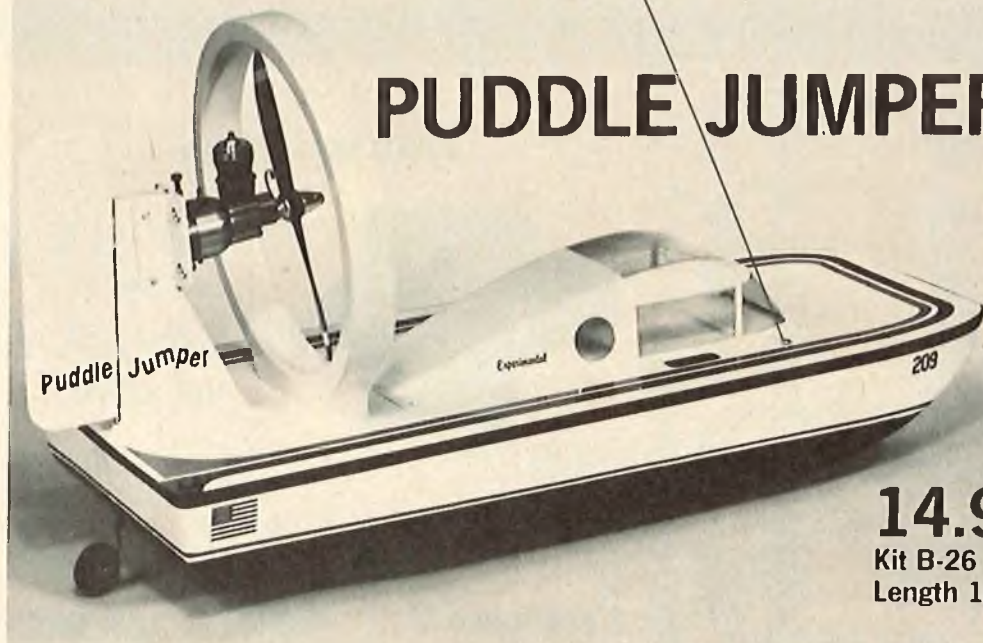
## PUDDLE JUMPER



Run it on land



Or in the water



**14.95**  
Kit B-26  
Length 18½"

Designed expressly for 2 channel R/C (plenty of room for just about any R/C) and .049 throttle control engine, this amazing air boat/amphibian will give you more pure pleasure than you can imagine — it's equally at home in a swimming pool or pond as well as a school yard or any smooth surface.

... And it's so easy to build — both the rugged plastic hull and cabin are precisely formed. Main inner structure and deck are accurately die cut plywood as is the balsa. Included is nylon motor mount — easy to follow step by step plans, decals, hardware etc. See this beauty at your dealer.

### EARLYBIRD BIPE

from page 120/64

ition: When all else fails . . . try following the instructions! Or, as Bob Dunham stated in his early Orbit (tube-type receiver) instructions "skip the instructions . . . you can read them by the bright blue

flash of B-Plus to filament!" In short, B.L.D.G.P. (Build Like The Dad-Gummed Plans). This next step is the single most important element in the entire assembly procedure. Please don't skip it.

### FINAL SET-UP

On a level surface like the kitchen table, prop up the tail of your EarlyBird until the top of the fuselage is level with the table surface by measuring from the

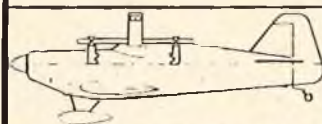
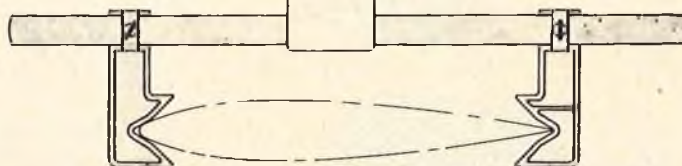
table to the top of the fuselage just aft of the tank hatch and, again, just forward of the stab. To be sure it's level, measure from the table to the center of the stabilizer leading edge and the center of the elevator trailing edge (with the elevator precisely in neutral, of course). The measurements at the center of the stab leading edge and elevator trailing edge should be exactly the same — if not, adjust the prop under the tail so that the

**NEW**  
Model Incidence Meter  
PAT. PEND.

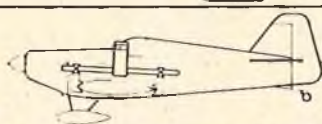
Another Robart Exclusive

ROBART'S NEW INCIDENCE METER—A MUST FOR SETTING PROPER THRUST, WING AND STABILIZER INCIDENCE ON A NEW MODEL—OR DETERMINING WHY YOUR PRESENT MODEL DOESN'T FLY STRAIGHT.

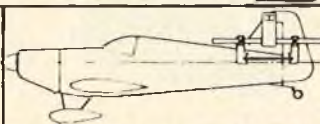
**\$13.95**



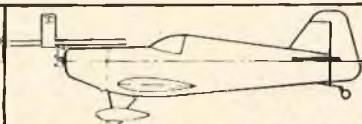
STEP 1: LEVEL THRUST LINE WITH WORK SURFACE (90° ON INDICATOR DIAL—SANDBAGS AND A SUPER STAND EASE THIS TASK)



STEP 2: SET PROPER WING INCIDENCE (SET 0° FOR PER PLANS. YOU CAN ALSO CHECK WASHOUT BY SIMPLY MOVING THE DEVICE OUT THE WING TIP AFTER STEP 2 AND READING THE ANGULAR DIFFERENCE.)



STEP 3: SET STABILIZER INCIDENCE (USUALLY 0°)



STEP 4: SET ENGINE THRUST (IF ANY, IF NONE SET AT 0°)

**robart**  
P.O. BOX 122 WHEATON, ILL. 60187



# For Beginners or Experts

**19.95**

Kit FS-35  
Span 40"



The New

## MINI-FLEDGLING

If you've seen or flown our Fledgling it will give you an idea of the great performance you can expect from its little brother. Maintaining top quality & simple construction, all balsa & plywood parts are accurately die cut including full length fuselage sides, includes R/C hardware, decals full size step by step plans. Recommended engines .049 or .051 & 2 channel R/C although other suitable equipment may be used.

STERLING MODELS • 3620 'G' ST. PHILA. PA. 19134

If no dealer available, direct orders accepted — with 10% additional charge for handling and shipping. (60¢ minimum in U.S., \$1.25 minimum outside U.S.)

- ☐ Catalog of entire line of airplane control line model kits. R/C scale and Trainer kits, boat model kits, accessories, etc. 50¢ enclosed.
- ☐ "Secrets of Model Airplane Building". Including design, construction covering, finishing, flying, adjusting, control systems, etc. 25¢ enclosed.
- ☐ "Secrets of Control Line and Carrier Flying". Including preflight, soloing, stunting, Carrier rules and regulations, Carrier flying hints and control line installation instructions 25¢ enclosed.

No checks. Only U.S. money orders or currency accepted.

Name \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

stabilizer is level (0 degrees).

Now eyeball your engine from the side. If it's pointing straight ahead, or slightly down, great. If not, make a note to add washers as necessary to achieve straight (or slightly down) thrust. Next, eyeball the engine from the top. It must be straight ahead or have a touch of right thrust; that is, your prop nut should point ever so slightly to the right when looking from tail toward nose and down onto the

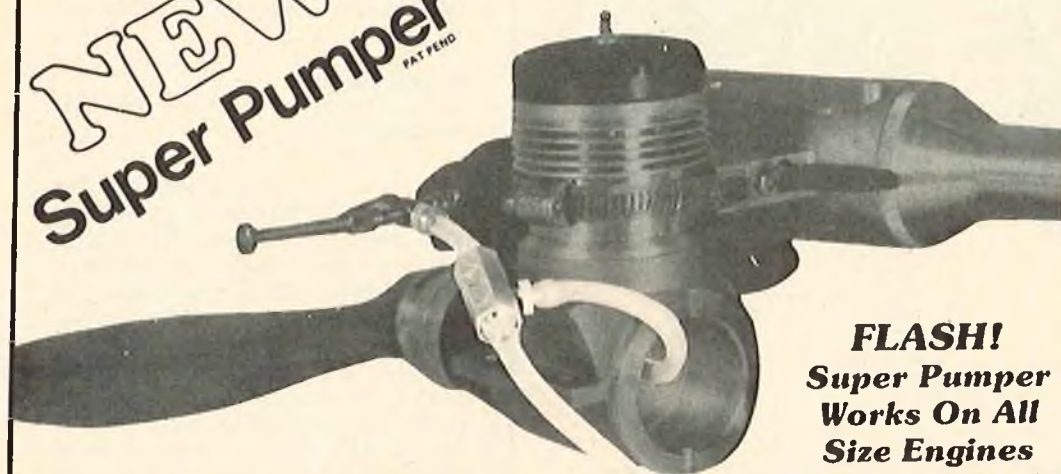
engine. Don't correct the thrust adjustments now, just make a note to do so before flying (then remember to do it, for goodness sakes!).

With the stab still level, measure from the table surface to the center of the leading edge of the bottom wing and from the table to the center of the trailing edge. Are the fore and aft vertical measurements precisely the same? They must be! The only deviation permitted is

that the *leading edge* of the bottom wing may be 1/32" higher (longer measurements from table top) than the trailing edge, but no deviation is preferable. Anything else is unacceptable and must be corrected by trimming the fuselage wing saddle as necessary, then re-checking, as above, until the wing is 0 degrees angular difference (decalage) with the stabilizer — or no more than 1/32" positive incidence. The same is

### Another Robart Exclusive

**NEW**  
**Super Pumper**  
PAT PENDING



**FLASH!**  
**Super Pumper**  
**Works On All**  
**Size Engines**  
**1/2A - 1.5 Cu. In.**

**SUPER PUMPER—A NEW 'IN-LINE' FUEL PUMP THAT'S NOT MUCH LARGER THAN A FILTER. SPACE AGE VALVES AND DIAPHRAM PROVIDE SIMPLICITY AND RELIABILITY. YOU DON'T HAVE TO BUILD AN AIRPLANE TO FIT YOUR PUMP WITH SUPER PUMPER. WORKS ON REAR ROTORS TOO!**

**SPECIAL PRESSURE TAP INCLUDED**

**\$15.95**

**robart**  
P.O. BOX 122 WHEATON, ILL. 60187

ROBART PUMP TAP / METERED FUEL PUMP TAP .98



# PERI-POD™ + Your Sailplane

## THE BEST R/C POWER FLIGHT TRAINER YOU CAN OWN!

Peri-Pod is the exciting, practical system for launching sailplanes . . . But MORE . . . Peri-Pod provides a new opportunity to learn R/C power flight with far less demand on your pocketbook and reflexes. Peri-Pod stabilizes the already gentle sailplane. Power trainers can't match this docile combination. Peri-Pod is the result of many years of creative development.

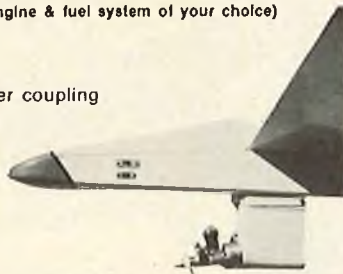
**\$23.95** Inc. 'chute, adaptor, Pod (use .09 or .049 engine & fuel system of your choice)

- Meaningful warranty
- Hi-Impact styrene pod
- Delrin, low friction adaptor, with anti-vibration elastomer coupling
- Unique, anti-thermal 'chute (fuelproof)
- Dependable, simple chute deployment device
- Complete system brochure with schematic for servo control drop from elevator push rod.

Ask your dealer or order direct

Shipping prepaid

C.O.D. \$1.00 per order



### Bluewater Crafts, Ltd.

P.O. BOX 55 NORTH STREET, MICHIGAN 48049



## Flying Near Airports? Be Careful!

Free Flight or Radio Control flying near airports, or in any situation which might involve the possibility of models being in the vicinity of full-scale aircraft operations, must be avoided—or conducted so as to eliminate any dangerous situations. Models should not be flown in the proximity of full-scale aircraft operations unless the flyer has someone else with him for the sole purpose of watching for full-scale aircraft and supervising the flying so as to prevent accident possibilities.

PROTECT YOUR RIGHT TO FLY!

### Safe Flying Is No Accident!

### STAGGER WING



- SCALE 1 1/8" LENGTH 46 1/2"
- WINGSPAN 55" WING AREA 1000 sq. in.
- ENGINE .60 WEIGHT 8 lb.
- FIBERGLASS FUSELAGE COIL
- FOAM WING CORES FOAM STABILIZER & RUDDER
- SPECIAL MOTOR MOUNT INCLUDED IN KIT
- ALSO LANDING GEAR HARDWARE
- HARDWARE FOR MOUNTING COIL
- ALL LEADING EDGE & TRAILING EDGE STOCK
- ALSO ALL PLYWOOD FOR FORMERS SUPPLIED IN KIT
- ONE OF FEW BIPLANES CAPABLE OF USING RETRACT GEAR

**\$119<sup>95</sup>**

Scale 3 pc. Aluminum spinner optional, Price \$15.00

### GNAT SPORT BIPLANE



- FUSELAGE LENGTH 32 in.
- WINGSPAN 36 in. WING AREA 489 sq. in.
- ENGINE .23 to .40 WEIGHT 3 to 4 lbs.
- Balsa FUSELAGE JIG BUILT WITH ALL FORMERS GLUED IN PLACE FOR TRUE ALIGNMENT
- FOAM WING CORES AND SHEETING
- ALUMINUM LANDING GEAR & WING STRUTS
- FIBERGLASS RADIAL COIL
- ALL WOOD SUPPLIED IN KIT PRESHAPE
- ADJUSTABLE CABANE STRUT FOR EASY TOP WING LINE UP

**\$59<sup>95</sup>**

DEALER INQUIRIES INVITED

### LENCO PRODUCTS

219 FIRST STREET • BUCHANAN • NEW YORK 10511

true for the top wing. Do it!

Now eyeball the top and bottom wing from the front, nose-to-nose with your engine prop shaft. Is the alignment correct laterally? You can check by measuring from the right and left tips of the bottom wing to the table top, then check the top wing the same way. To be sure the landing gear isn't throwing you off, center the fuselage laterally, measuring for equal spacing between the right and left stabilizer tips and the table top.

Make any engine thrust adjustments necessary and balance your EarlyBird at the point shown on the plans. The nose may hang slightly down when balanced at the point shown, *but the nose may not point up even a little bit*. If it does, shift the batteries or add weight to the nose as necessary for balance.

One hour spent on the preceding set-up will be worth many hours trying to fly an out-of-trim or unbalanced airplane (or rebuilding a splattered mess).

### FLYING

Tell all the guys gathered around that it's an EarlyBird and ask them to leave you and your instructor alone for a while, then perform a radio check following your radio manufacturer's instructions and another with the engine running. Be certain your engine is properly broken-in with a reliable idle. If you're a newcomer, get an experienced flyer to make the first flight, giving you the box when your EarlyBird is trimmed out and high enough to keep you out of trouble (at least two mistakes high). Tell him to hold some up elevator and simply keep it straight ahead until it takes off, then ease the elevator off to neutral. He'll tell you when you're ready to take-off by yourself and (later on) let you know when you're ready to flare out to your first smooth landing. He might even explain why you stretch a short, power off landing by *dropping* the nose a bit and shorten a possible over-shoot by holding a bit more back pressure on the stick than for a normal landing.

When you're tired of impressing the local troops by boring holes in the sky, try practicing the AMA "A" pattern. You may find you're better than you thought.

Enjoy! □

### TWEEDY BIRD

from page 62

. . . . . bottom leading edge sheeting rather than to the top leading edge sheeting. On page 5, if number 5 instruction were followed, it would not be possible to glue in the dowel plate. The instructions should be modified indicating that the dowel plate should be glued in before sheeting is completed. On page 7, the doubler has to be glued to the front edge of bulkhead number 1 or the triangular stock has to be cut out so that the sides fit flush to bulkhead

to page 132



## North American P-51 **MUSTANG**

.29 - .40 Stand Off Scale R/C

Designed For The Sport Flyer

## Fairchild PT 19 Primary Trainer

.29 - .40 Stand Off Scale R/C

Designed For The Sport Flyer

## Messerschmitt ME 109G-2

.29 - .40 Stand Off Scale R/C

Designed For The Sport Flyer

## FOCKE-WULF Fw-190D-9

.29 - .40 Stand Off Scale R/C

Designed For The Sport Flyer

Featuring New Self Aligning, Self Jiggling,  
JEM LOC Super Fast Fuselage Construction.

**KITS INCLUDE:**  
● Foam Wing Cores & Balsa Sheeting With Instructions ● Complete Hardware Package ● Beautiful Decal Sheets ● Full Color Notes ● Molded Canopies, Cowls, Exhausts & Gun Blisters (where applicable) ● 4 - 6 Channel Operation ● Written Instructions ● Flap and Retract Plans Available (where applicable) ● "Wonderful World of Stand Off Scale Flight Training Manual" Included (also available separately) ●

**ALL JEMCO KITS**

**\$48.50**

/EACH

WRITE TODAY FOR A FREE  
JEMCO CATALOG

**DEALERS WANTED**

Write or phone for information  
on our dealer program.

**JEMCO**

1305 Foothill Drive, Vista, California 92083  
(714) 724-3242

## TWEEDY BIRD

from page 128/62

number 1. On page 9 we would recommend that the NyRod tube be anchored to the fuselage side before the bottom sheeting is completed. On page 12 the "U" cut-out on the cowl is not on the plans as indicated in the instructions.

Overall this is an outstanding kit with excellent instruction manual and plans with only the minor corrections previously mentioned. In the performance category the Tweedy Bird must be ranked as outstanding — another excellent aircraft from Bridi Enterprises. It is extremely pleasant to handle and flew hands off on the first flight. It has an excellent roll rate, a fine glide pattern with no snap or tip stall tendencies noted. It performs all maneuvers with ease. We would have to rate this kit as excellent. □

## TACH-TRON

from page 61/57

system, and with a six or eight channel system, which has even lower frame rates, it is even farther away. In its final form at 1000 RPM with six magnets, you get 6000 timing updates per minute. You can be sure of one thing — it doesn't lack resolution. With the new timings, the 60 hertz line frequency can still be used for bench testing. With the governor version, this is not necessary, unless you want to play. On the collective version, this is a must. The governor version can easily be set up on the machine. I have calibrated the collective version on the machine, but I am not sure that everyone could.

If you use a small 6 or 12 volt transformer and half or full wave rectify with diodes, you can get 60 or 120 hertz from the transformer. This will give you a simulated 600 or 1200 RPM. I will tell how to do this in the construction portion under calibration.

The prototype governor did not have versatility. It could not be adapted to the various system timings and pulse polarities. It was strictly a positive pulse, 1 to 2 ms in time to match the auxiliary timing of my R/C system. It also did not employ a feedback system. It could not hold the RPM to less than a 250 RPM change with pitch loading.

At the outset, it was not even known if you could fly a model helicopter using a governor. I had to prove that it could work, and then proceed with better circuit design, coupled with many test sessions followed by revisions. It was a slow evolution, solving the problems one at a time. Sometimes when you solved one, it would create another. The total process took nearly two years. The end result

to page 134

# get STUK

AMAZING NEW ADHESIVE



**1 oz. STUK \$6.00**

**1/2 oz. STUK \$3.50**

STUK is Alpha Cyanoacrylate contact adhesive. Competitors offer 1/2 oz. for \$5.70 and up. ECONOMY PLUS offers 1 oz. for \$6.00 or 1/2 oz. for \$3.50. YOU CAN'T GET STUK ANYWHERE ELSE BUT HERE! Dealer and Distributor inquiries invited.

**economy plus**

DIVISION OF STORM KING INDUSTRIES, INC.

P.O. BOX 4145

NEW WINDSOR, N.Y. 12550

## SCOUT 9-72

A new and unique R/C Sailplane. De-

signed for the traveling man. ---Back-pack it into hills to play with hawks. Hand-carry it on planes. SCOUT can be taken apart to fit in the 8 x 8 x 22 converted kit box with room for Hi-Start, Trans., Power Pod, etc. ---Sturdy, to assure survival in far away places. PERFORMANCE? "Caught a thermal and held it for an hour and a half. Had trouble getting SCOUT down!"

**32.50**

Dealer or

by Mail

Span-72"

Length-36"

Area-560" Wt. -21oz. +R/C

In Stock: METRIC G-80, 32.50 • FLOATER G-110, 39.50  
SPECIAL PRICES for re-worked plywood kits, Write.

**Jasco**

Box 135 • Northridge  
California, 91328





**\$3.95**  
4 oz.

**GENERAL PURPOSE ADHESIVE  
IN PASTE FORM FOR EASY USE.**

## TWIN-WELD EPOXY

**Ideal For Bonding The Following**

- HARDWOOD TO FIBERGLASS
- FIBERGLASS TO FIBERGLASS
- METAL TO FIBERGLASS
- HARDWOOD TO FOAM CORES

**FIBERGLASS REINFORCED  
REMAINS FLEXIBLE**

Available at your favorite dealer



**MIDWEST MODEL  
SUPPLY CO.**

6029 W. 55th St. Chicago, Illinois 60632 312-586-7101

A FULL LINE MODEL DISTRIBUTOR  
SERVING DEALERS FOR OVER 30 YEARS

**THUNDER TIGER  
.15-II ENGINE**  
Made In Taiwan Sale **\$9.60**  
**High Power — Low Cost**



Please Write To:  
**Scientific Hobbies Ltd.**  
185-D Prince Edward Rd., MongKok  
Kowloon, Hong Kong

## Helicopter

**Graupner**

**FACTORY  
AUTHORIZED**

**PARTS CENTER  
BELL 212 & 47G  
FISHER RC**

17 Salmi Road,  
Framingham, Mass. 01701  
(617) 877-1116

## VINTAGE R-C PLANS



**BEECHCRAFT G-17S "STAGGERWING"**  
DESIGNED BY R.C. SWEITZER  
**64"** WING SPAN, 2" SCALE, MULTI  
PLANS: 4-36" X 84" SHEETS  
TRULY — **Plans \$15.95**  
A SCALE MASTER PIECE!! \$1.50 POSTAGE

NEW CATALOG 50¢ - DEALERS WELCOME -

**SID MORGAN**

13157 Ormond, Belleville, Mich. 48111



## "SMALL WONDER"

- Very Stable Parasol
- .09 to .15 Engines
- 3 Channels

**\$28.95 postpaid**

**MICHIGAN HOBBY  
HANGAR**

460 W. Broomfield Rd.  
Mt. Pleasant, Michigan 48858

Order Direct — Dealer Inquiries Invited

**PROCTOR** HARDWARE



- WORKING TURNBUCKLES
- RIGGING & CONTROL CABLE
- CONTROL HORNS
- STRUT FITTINGS
- SHOCK CORD
- COCKPIT TRIM
- PULLEYS
- INSTRUMENT HOUSINGS



For additional information, brochure and catalogue send 0.50¢

PROCTOR ENTERPRISES INC.  
P.O. BOX 9641

SAN DIEGO, CA. 92109

**DEALER INQUIRIES INVITED**

MFGD. AT 6821 CONVOY CT. SAN DIEGO, CA.

**SCALE CLASSICS  
CURTIS HAWK P6E  
2 IN. SCALE \$10.50**



**PLANS AND CONSTRUCTION MANUAL**  
CURTISS HAWK P6E (2 Sheets) ..... \$8.50  
1 1/2" Scale — 47 1/4" Span  
CURTISS GOSHAWK F11C-2 (2 Sheets) ..... \$10.50  
2" Scale — 63" Span  
CURTISS 'GULFHAWK' 1A (3 Sheets) ..... \$15.00  
2" Scale — 63" Span  
STINSON RELIANT SR9 (2 Sheets) ..... \$12.50  
2" Scale — 84" Span  
1 1/2" Scale — 63" Span ..... \$10.50

ADD \$1.50 FOR POSTAGE & HANDLING

SEND \$1.00 FOR COMPLETE INFORMATION

STAND-OUT SCALE AT ITS FINEST

**BARRONS SCALE CLASSICS**

1213 Holly Spring Lane, Grand Blanc, Mi. 48439

## TACH-TRON

from page 132/57

sult justified the efforts, because it provides up/down precision which one finds hard to believe. It also opens some new avenues, like possibly inverted flight because you can make full use of your collective pitch, even in the negative direction.

To control the RPM of something, the following must be determined: Are the RPM too slow, are they as desired, or are they too fast? Using two monostable multivibrators, to measure what is happening, gives us this capability. The pulses from the read head will be referred to as incoming trigger pulses. The space between them is a direct function of the RPM. The amplitude also is a function of RPM: A pulse of usable amplitude can be obtained at RPM's around 100 or over. This is with a "read head gap" of .025" spacing between the head and wheel. This minimum gap insures that the head will not be damaged by riding the magnet wheel. The incoming trigger pulses are first amplified and shaped, and then used to trigger the first monostable multivibrator.

For a better understanding of what is happening, one can refer to the logic drawing numbered Figure 1 as he reads. Some timings are now necessary. The timings given will be those present as the system functions at 1000 RPM. The two multivibrators will be called the repetition rate mono or rep mono for short and the reference mono or ref mono. The ON time of the rep mono is  $T_1$  and that of the ref mono is  $T_2$ .  $T_3$  will be the time between incoming trigger pulses. The system is designed to have the rep and ref monos function at an approximate 50% duty cycle at the point where they start to limit RPM. This duty cycle is adjustable and is the actual RPM adjust on the system. Both duty cycles, the rep and ref, are controlled from a common point and track together as they are adjusted. Let us assume that the adjustment was set for 4 ms for  $T_1$  and 4 ms for  $T_2$ . At 1000 RPM,  $T_3$  would be 10 ms. An incoming trigger pulse starts  $T_1$  in action, when it times out 4 ms later, it starts  $T_2$ . At this point the rep mono will be free to accept the next incoming trigger pulse when it shows up. If the outputs of the two monos are connected correctly to a NAND or a NOR gate, the output of that gate will be a usable function. It will produce what we will call an error pulse and the gate will be called an error gate.

If  $T_1$  and  $T_2$  were both 4 ms, their combined total would be 8 ms. They both will have timed out before the next trigger. At 10 ms trigger rate, this would be 2 ms after  $T_1$  and  $T_2$  were gone. Under this condition, no error would exist. Figure 2 shows waveforms pre-

to page 138





535 DAVISVILLE ROAD • WILLOW GROVE, PA. 19090 • (215) 659-3900

## NOW... THE SUPER POWER TEAM

### This Could Be The Start of Something Big



### SUPER/GEL... EXPRESSLY FOR MODEL USE

Say "goodbye" to batteries really designed for something else. No need to "make do" anymore. Super/Gel is here with:

- Fast Charge & Discharge Needed for Models
- Sealed-In Gel. No water, no spill, no leak
- A Full 4.5 amp hours between recharges
- Long Life. Recharge 500 Times or More

### SULLIVAN CHARGER... A GREAT TEAMMATE

- UL Listed, Plugs Into Ordinary House Current.
- Fully Charges Battery in 12 Hours.
- 500 ma. Output, Ideal for our New Battery
- Can Be Used For Most Wet Cell Batteries, Too

#### STANDARD OR DELUXE?

Pick model that suits you best. Deluxe has aluminum cone and pulley instead of nylon. Ideal for helicopters and boats in addition to planes and cars.



U.S. Patent #3939369

### SUPERSTAR OF STARTERS

We really started something when we introduced this baby a few years ago. It turned on hobbyists all over the world—that's why it's #1.

- Heavy Duty, Long Life Motor
- Higher Torque & RPM's Than Any Other Starter
- "Instant-on" Strip Switch & Safety Hand Guard
- 2 Year Guarantee—Some Free Parts for Life

## 5 COMPLAINTS OUT OF 80,000 SHIPPED IS SOME KIND OF RECORD

By Matty Sullivan

When we introduced our new starter a few years ago, I knew it was going to be a winner. Everything just seemed right. It was tough, durable, powerful; it had everything.

But I never would have predicted how great it turned out to be. I just looked over a report that shows we have shipped 80,000 of these starters so far. And do you know how many complaints we have? Five. Really only three because one had the nylon chewed up by a dog and another was in the trunk of a car that caught fire.

That's got to be some kind of record for a product that carries a guarantee. And, speaking of guarantees, the performance of this starter has been so good that I'm going to add to the guarantee. From now on, if the switch or the two molded nylon parts ever go bad, send me the bad part and I'll send you a new one free.

Maybe it seems funny to you to talk about replacement parts because you've got

some other kind of starter that can't be repaired. Well, I'm a model builder too. And the way I look at it, building and fixing things myself is the name of the game. That's why we designed this starter in such a way that the model builder could do his own minor repairs.

Take the switch, for instance. It's not much of a job to take it apart and adjust it to anywhere from hair trigger to hard. Maybe you don't realize it, but you can even adjust it for right or left-hand use.

Here's a tip that could save you some problems. If you ever have to replace the wire, use 14 gauge. If you're going to make an extension from your car battery, be sure to use 12 or 14 gauge because anything less than this size will cost you power. Please, don't use lampcord.

If you like the idea of the hand grip for safety, I've got an "inside" story to tell you. See, we just lucked out on that feature. Originally, we designed the hand guard

onto the starter so you could apply extra power to the spinner. It didn't dawn on us until later that this was really a great safety feature. It helps prevent an oily hand from slipping into a prop.

Of course, using a starter instead of flipping with your fingers is safer in itself. Even the best of us have had many painful experiences and have had to see a doctor or two. And I've got the scars to prove it.

All of these advantages of the Sullivan starter have Europe and Asia turned on, too. It's ironic, but now Japan and Germany are among our biggest customers. Remember how we all bought their products just a few years ago?

And the Russians. A couple of years ago I met some of the Russians at Lakehurst and gave them a few starters. Now, whenever Russians take part in a European contest, the one thing they want to take back is a Sullivan starter. Have you ever heard a Russian say "Sullivan"?



Span: 73 In  
Area: 580 sq in  
Wt: 24 oz  
Kit: \$38 (post free)

Standard dealer discount, order  
factory direct from:  
Superior Flying Models,  
4027 So 275 Pl, Auburn, Wa 98002  
or from Royal Products Corp. or  
Futaba Sales (Australia)



## from page 134/57

sent with these timings. To get an error, we must either increase the RPM or lower the governor setting. For this discussion, we will do the latter, and set the governor lower. We will set  $T_1$  and  $T_2$  at 6 ms each and see what happens. A trigger starts  $T_1$ , 6 ms later,  $T_1$  ends and starts  $T_2$ . It also will last for 6 ms, but 2 ms before it is gone, a trigger again starts  $T_1$ . Now they are both ON at the same time for a duration of 2 ms until  $T_2$  is gone. A 2 ms error pulse will show up at the output of the error gate. This is because  $T_1$  plus  $T_2$  give a total of 12 ms, but  $T_3$  is only 10 ms. This process is repeated as each trigger shows up, so a 2 ms error would continue to exist if these times remained constant. Figure 3 shows these timings, and the resulting error pulse.

Any time that the incoming trigger is less than the combined  $T_1$  plus  $T_2$ , the condition will be called over-run. The system will accept an 80% over-run. Let's look at the timings. The maximum duty cycle unbalance which the circuit will accept is 20% OFF and 80% ON, (referring to the rep and ref monos). This means they can be OFF 2 ms and ON 8 ms out of the 10 ms trigger rate of 1000 RPM. If this condition existed,  $T_1$  plus  $T_2$  would give a total of 16 ms. Subtract 10 ms, and you have an error pulse of 6 ms. This shows that the possible error at 1000 RPM could be anywhere from none to a 6 ms pulse, and the governor would still be accurately clocking the RPM.

Now that we have shown that an error pulse can be generated using this method, we must do something with it to correct the error condition. The error pulse is fed to an error amplifier, which converts the error to a given DC voltage, the level of this voltage is dependent upon the amount of error in existence. Another mono is now introduced, which is called the control mono. The error voltage is used to control the pulse width of this mono. The control mono is triggered by the decoded servo pulse from the receiver channel being used. It has a calibration adjustment to set it to the channel timing. This would be comparable to centering a servo to a particular channel. The same technique is again used to compare pulse times, which is done in another gate. We will call this the control gate.

Let us assume that the system was connected to an R/C throttle channel, which provided a pulse of 1 ms in width at idle and 2 ms at full throttle. The control mono would be calibrated to approximately 2.2 ms. The control gate, when connected for this mode, will have an output controlled by the shorter pulse coming in. If the control mono was at 2.2

## DON'T LIKE TO BUILD?

Custom built models to any stage you desire. Quality materials used with pride. Beautiful finishes by Donscheski. **REALISTIC PRICES.** GREAT prices on radios, engines, retracts and accessories when installed on our models. Price examples:

**GLASS DIRTY BIRDY** ready for your engine and equipment \$325.00

W/Rhom ret. and Kraft .61 installed \$485.00 — W/Kraft KP7-C or CS & ret. Serv. Inst. \$900.00

**UGLY STIK Framed-up \$85.00      MonoKoted \$115.00**

W/K & B .61 and all acc. installed \$190.00 — W/Kroft KP5-C or CS installed \$500.00

QUICKIE 500 Fromed-up \$65.00 MonoKoted \$90.00

W/K & B .40 and all acc. installed \$145.00 — W/Kraft KP5-C or CS installed \$455.00

Complete Mod/Eng/Radio units are test flown before shipping, using a substitute engine. All prices are plus shipping to all and plus tax to Texas Residents. We try to keep most popular models framed-up in stock. Send SASE with complete description of model and/or equipment desired for a prompt quote and estimated delivery date.

410 West Ninth St., P.O. Drawer Q, Plainview, Texas 79072

(806) 296-7767

**Watch For New Easy-Build- Easy-Flying WW I Stand-Off Scale Kit**



# KRAFT CENTRAL

7843 RAMSGATE DRIVE

■ KNOXVILLE, TENNESSEE 37919 ■

AUTHORIZED



SERVICENTER

## COMPLETE PARTS & REPLACEMENTS INVENTORY

**FAST — PROFESSIONAL REPAIR SERVICE**

24 HOUR TURN-AROUND (TYPICAL)

**LICENSED & CERTIFIED PERSONNEL**

**FAST — SAFE  
UPS SHIPPING**

**SERVICE ALSO PROVIDED FOR,  
KSE AND KGL SYSTEMS**

CARL SMITH  
(615) 693-8605



ms and throttle at 1 ms, then 1 ms would go to the servo from the control gate. Now let's open the throttle and move the pulse to 2 ms. RPM will build up, an error pulse will appear, and it will be changed to a DC voltage and pull back on the control pulse width. It will shorten it from that static condition of 2.2 ms to a point where it is the shorter of the two inputs into the control gate, and feed this new time to the servo, lowering the RPM and reducing the error. The system will reach an equilibrium at the RPM setting of the governor. To insure that this equilibrium can be attained, a sensitivity adjustment has been provided. If this is adjusted too high, the system will "hunt". It will overshoot the RPM adjust, cut back too much on the RPM, and then find itself adding some again. The point where this occurs will vary from one machine to the next, since many factors are involved: Servo speed, engine acceleration, engine mixture, pitch load, rotor weight, etc. This shows the need for the sensitivity adjustment. The device can be optimized on a given machine. If the sensitivity is adjusted too low, a large loss of RPM will occur when load is applied.

The Tach-Tron was designed with a built-in flexibility to allow it to be used with about any R/C system. As it is wired, it is connected internally to meet the requirement of a given system, once the modeler knows which model his radio will require. If he does not know, instructions are given, telling him how to determine this.

Thus far, the Tach-Tron has been described in its application as a governor. It was plugged into an auxiliary channel, advanced until the engine is under the control of the governor and the copter was then flown by means of collective on the main stick of the transmitter. Reference was made to collective control, as a function of RPM, using the device. This also can be done in the following manner: The Tach-Tron is again plugged into an auxiliary channel (having been internally connected for the collective pitch mode), but the collective pitch servo is now plugged into the device. The throttle is now plugged into the stick control channel as one would when flying by throttle. When the Tach-Tron is wired for collective pitch control, the Cal and Sense adjustments control the travel limits of the collective pitch servo. These adjustments must be made on the bench prior to installing the unit in the machine. After installation, the RPM adjust will then be used to set the RPM at which full collective pitch occurs. It was stated that in the governor mode as the RPM reached the governor setting, an error pulse would appear. When connected for use as collective pitch control, the error gate produces an error pulse which decreases in length as RPM increases. When reaching the RPM setting, the error pulse will disappear. This is because the error gate is connected to the

We've got a colorful story...

## *pactra* **AeroGloss**



**hot  
fuel  
proof  
dope**

In fact, over 36 colors... in both hi-gloss and flat finishes. You can choose brush or spray in eight convenient sizes. BUT the colors are not the whole story. For over 26 years Pactra's Aero-Gloss Dope has been used by more "Award Winning" modelers than any other brand. WHY? **DEPENDABILITY.** A consistently durable hot fuel proof finish that holds up under the rugged handling a flying model must endure. Aero-Gloss looks good when you put it on, and stays looking good... that's a pretty important story for your pride and joy!

TRY THESE OTHER "CONTEST QUALITY" PRODUCTS FROM PACTRA



### *Premium* **BALSA WOOD**

- HAND SELECTED
- PRECISION SANDED
- SHEETS • STICKS
- DOWELS • EDGES
- TRIANGLES • BLOCKS
- PLANKS

### **Solar Film**

EXCLUSIVE LOW-HEAT  
COVERING FOR  
FOAM & BALSA  
FLYING MODELS  
flexible • durable  
fuel proof • lightweight



**pactra Industries, Inc.** 7060 HOLLYWOOD BLVD., LOS ANGELES, CA. 90028

Write For **FREE BROCHURE**

On Our Complete Line Of

**R/C PROPORTIONAL EQUIPMENT**

including

**WORLD'S SMALLEST SUPERLIGHT  
DIGITAL CONTROL SYSTEMS**

**SMALLEST SIZES**

(PLEASE SEND AIRMAIL

**LOWEST PRICES**

POSTAGE)

13400-26 Saticoy Street

North Hollywood, Calif. 91605

Phone (213) 764-1488





# DODGSON DESIGNS ■ TOMORROW'S DESIGNS TODAY

## 1976 WAS A VERY GOOD YEAR FOR THE MAESTRO MK III AND MAESTRO CALIENTE

FINLAND—TIMO JALASTERA won the 1976 FINNISH F.A.I. CHAMPIONSHIPS flying a MK III.

CANADA—JULIUS TOPF won a place on THE CANADIAN F.A.I. TEAM, flying a MK III, winning the Western Finals and achieving the HIGHEST NORMALIZED SCORE OF ANY QUALIFIER.

N.W. UNITED STATES—BOB DODGSON was awarded the 1976 NORTHWEST SOARING SOCIETY GRAND CHAMPIONSHIP, flying a Caliente for the highest percent average for 8 contest days. He also won 4 major 2-day N.W.S.S. contests with the highest overall scoring, flying the Caliente. This is Bob's 2nd N.W.S.S. Grand Championship, having won the honor also in 1973. This makes the 4th straight year that Dodgson Designs planes have won the Northwest Grand Championship.

DAVE BANKS with his MK III won the F.A.I. REGIONAL SEMI-FINALS, and placed a close 2nd again this year to being the N.W.S.S. Grand Champion winning 3 major N.W.S.S. contests.

CALIFORNIA—RANDY VERMULM from Stanwood, Washington, achieved the HIGHEST TOTAL SCORE OF ANY OF THE 124 ENTRANTS IN THE 4 MAN-ON-MAN EVENTS IN THE 1976 L.S.F. TOURNAMENT with 3,971 pts. out of 4,000 possible. This is flying 99.28% OF PERFECT in the grueling man-on-man events. Randy flew a MK III.

MIDWEST—DWIGHT HOLLEY won 2ND OVER-ALL AT THE 1976 S.O.A.R. NATIONALS competing against more than 200 flyers. Dwight flew his MK III.

JIM BENSON won numerous 1976 trophies flying his Caliente, including his recent 1st place win at the MICHIGAN EXCHANGE MEET.

EAST COAST—DWIGHT HOLLEY DID IT AGAIN this year flying his MK III to 1st place overall victories in many of the major contests. DWIGHT AND HIS MAESTRO HAVE BECOME A LEGEND OF EXCELLENCE AND CONSISTANT WINNING.

The MAESTRO is the one kit that outstanding flyers can still move up to and find a whole new arena of FRESH CHALLENGES, INCREASED PERFORMANCE POTENTIAL and a HIGHER DEGREE OF SELF ACTUALIZATION as a flyer. Dodgson Designs has FOREVER BROKEN THE DEAD-ENDED 2-PRIMARY CONTROL FUNCTION BARRIER in gliders that all other major U.S. manufacturers have been courting for so long. THE CONTEST RESULTS OF 1976 ARE JUST A TASTE OF WHAT IS TO COME as the learning time-log period required for adjusting to the increased control and performance potential of the Maestro is passed through for more and more good flyers.

### PRODUCTS BY DODGSON DESIGNS

Prices Effective January 1, 1977

Maestro MK III Kit	\$109.95
Maestro MK III Ready-to-Cover	269.95
Maestro Caliente Kit	\$109.95
Maestro Caliente Ready-to-Cover	269.95
Todi Kit with 2 Sets Wings	\$ 94.95
Todi Ready-to-Cover	294.95
Todi Kit with 1 Set Wings	\$ 88.95
Todi Ready-to-Cover, 100" Wings	229.95
Todi Ready-to-Cover, 76" Wings	212.95
Hijacker II Kit	\$ 79.95
Hijacker II Ready-to-Cover	164.95
Gull II Kit	\$ 79.95
Gull II Ready-to-Cover	186.95

INQUIRE ABOUT OUR AIRPLANES BUILT-UP AND COVERED, READY-TO-FLY, LESS RADIO GEAR.

### NEW FROM DODGSON DESIGNS

We are proud to be able to offer the METTLER WINCH DRUM, one of the finest winch drums ever designed as part of our growing line of quality products. The Mettler Winch Drum is PRECISION HAND-MACHINED with a 1 1/4" dia. core, SUITABLE FOR USE WITH EITHER A 6-VOLT OR A 12-VOLT WINCH, and will INSTALL ON THE WINCH WITH NO MODIFICATION to the winch or the standard starting motor shaft. Our Mettler winch drum is STRONG, LIGHTWEIGHT and is PRECISELY BUILT AND BALANCED FOR SMOOTH TROUBLE-FREE OPERATION. PRICE \$35.00

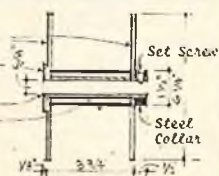
#### Machined-Turned End Plates of Tempered Aluminum

Steel End Cap -

Weld Typical at Both Ends

Steel Inner Core -

Steel Core Set Into Machined  
Channels in Alum. End Plates



SEND 2 STAMPS (International \$1.00) FOR CATALOG OF OUR COMPLETE LINE OF TOP QUALITY SAILPLANE KITS, INCLUDING THE NEW MAESTRO CALIENTE, THE MAESTRO MK I, MK II, AND MK III, THE TODI, THE HIJACKER II AND THE GULL II.

## WING WEDGE

Holds your wing while you make connections and adjustments

**\$2.95**  
See dealer first,  
if unavailable  
order direct,  
add 75c for  
handling.



It's like having  
an extra hand

**CYT-4 INDUSTRIES**

617 S. East Ave., Oak Park, IL 60304 (312) 848-8955

## HELICOPTER BLADES

MACHINED CLARK Y AIR FOIL.

You fit and finish, matched sets  
of select hardwood.

TWO SIZES - 2-1/8 cord x 30 long,  
and 1-3/4 cord x 20 long.

Shipped Air Prepaid - \$7.65 Pair.  
For the scratch builder, we have a  
limited supply of small ball bearings,  
write for list.

We also do custom  
machine work. Send  
your specification  
for quote to



**ROTOR EAZE** Box 1066, Ogden, Utah 84401

complimentary side of the monostable multivibrators, therefore the compliment is true at the output of the error gate. Since this is true, the RPM adjustment will determine the exact RPM at which full collective pitch will be obtained, since at this point the error pulse will be gone. RPM's above this point do not add more pitch.

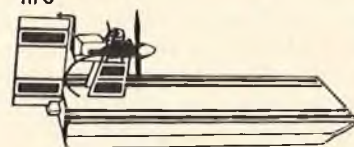
Initial tests are conducted with the RPM adjust set at its maximum or near maximum setting. The throttle is slowly opened to test for automatic movement of the collective servo. The auxiliary control on the transmitter will be at low pitch setting. If automatic pitch is properly being added, the throttle is advanced more to test for lift off. At this point, one notes the engine work load. If the RPM is becoming excessive, and lift off has not been achieved, more pitch must be added. This is done by coming back to an idle and turning the RPM adjust slightly in the CCW direction. A lift off is again attempted. The process is repeated until the proper RPM is present at lift off. Optimum performance can be obtained. Engine loading can be as desired.

One can see that an RPM controlled collective pitch system has advantages over flying with a fixed pitch system. If RPM is decreased to prevent "blooming" when moving into horizontal flight, one also gets a pitch change to help that condition. If the machine is in horizontal flight and slows or stops all forward motion, more throttle must be added to make up for the loss of transitional lift. Since the pitch comes in as a function of RPM, smaller RPM changes will provide the necessary correction. Smaller corrections reduce the time delay between application and action for a better response.

For test purposes, a dual Tach-Tron was built, one section being wired for collective pitch control. A mode switch was added to the helicopter to allow instant switching of modes while at the flying site. In this manner, both types of flight could be accomplished and data recorded without lengthy change-overs at the site. The mode switch was a four

to page 144

Aqua Boss R/C Dealers Welcome Air Boats



Length 36" Beam 14" Rec. Eng. .29-.46

- Precut plywood parts
- Detailed plans • Fast building
- A boat for "all the family" year around
- Fantastic on snow and wet grass

Photo brochure \$1.00, refundable first order  
\$39.95 plus \$1.50 shipping to:

**Windsor Manufacturing**

6617 Mahoning Ave. Youngstown, Ohio 44515  
(216) 792-6694





**84<sup>95</sup>**

**SUPER New Lightweight Fuselages!**  
Includes Mounting Hardware



**199<sup>00</sup>**

Red or Blue

**239<sup>00</sup>**

Complete With K & B  
40 Engine & Muffler

New "Superr Quiet"  
Chopper Muffler  
For any .40 size engine



**14<sup>95</sup>**

### • ACCESSORIES •

**STROBE EFFECT LIGHT** - Powerful, bright even in daylight! With 2 Bulbs, on-off switch, it uses 9 Volt transistor battery.  
**\$14<sup>95</sup>**

**FLASHING LIGHTS** - Reliable, Complete; Just add battery pack. 6 Lights, On-Off switch.

**FUEL WARNING LIGHTS** - Two Light System with On-Off switch, tank mounting hardware. Just add battery pack. Reliable.

**RECHARGEABLE BATTERY PACK** - Has Y-Connector for use with both Flashing Lights and Fuel Warning Lights.

**ALL 3 ABOVE, \$48<sup>95</sup> (\$16<sup>95</sup>..)**

**SUPER FLOATS AVAILABLE**  
**ADD \$19.95**

*We stock a complete assortment of kits, parts,  
and accessories for the "Rev-olution".  
We ship within 12 to 24 hours of your order!*



Dealer Inquiries Invited

All Aluminum Training Gear Available at \$15.95

**REV-OLUTION NORTHEAST**

63 Goodale St.

West Peabody, Massachusetts

01960

**(617) 535-3131**

### TACH-TRON

from page 140/57

position switch. The other positions were fixed pitch — variable RPM, and combined pitch-throttle. The comparisons of the four modes showed a definite improvement in response by using the system.

### DESIGN CONSIDERATIONS AND CIRCUIT DESCRIPTION

Figure 4 shows the schematic of the Tach-Tron. You can refer to it as you read through this portion of the text.

The following items were taken into account prior to the actual design; cost, power consumption, temperature stability, voltage stability, physical size, reliability, easy construction, and simplicity in application. The idea was to design a

system which would not give in to any of the items listed, yet would give the desired results. The design was modified several times because it did not meet one or more of the above requirements. I believe that the end result is a system which has the above features at minimum possible cost.

To keep power consumption low, C/MOS integrated circuits were used.  
to page 146

## Cobra 17 HIGH PERFORMANCE MODEL SAILPLANE

## Kestrel 19

### HIGHEST PERFORMANCE MODEL SAILPLANE

WING SPAN ..... 121.5 in.  
WING AREA ..... 717 sq. in.  
WING LOADING 10 oz. per sq. ft.  
@ 50 oz.  
OVERALL LENGTH ..... 47 in.  
WEIGHT ..... min. 50 oz.  
ASPECT RATIO ..... 20.5:1  
SCALE ..... 1:6

#### QUALITY ENGINEERED —

- Beautifully finished white Gelcote fiberglass fuselage
- Custom-molded Canopy
- Complete fuselage hardware
- Resin filler for wing rod and hardware installation
- Machine-cut wing and stab ribs
- Complete Balsa and Spruce wood kit
- Full plans and instruction manual
- Scale Decals

**\$89.50**

Cobra 15 slope version \$84.50.

**WINDSPIEL MODELS** ■ 835 Piner Road, Santa Rosa, Ca. 95401 ■ Shop Phone (707) 544-2334

#### QUALITY ENGINEERED —

- Beautifully finished white Gelcote fiberglass fuselage
- Custom-molded Canopy and Tray
- Complete fuselage hardware
- Resin filler for wing rod and hardware installation
- Machine-cut wing and stab ribs
- Complete Balsa and Spruce wood kit
- Full plans and illustrated instruction manual with photos
- Identification Decals

**\$89.50**

SPAN ..... 134.5 in.  
AREA ..... 852 sq. in.  
LENGTH ..... 49.5 in.  
WEIGHT ..... 52 oz. min.  
WING LOADING ..... 8.5 oz./sq. ft. to  
10 oz./sq. ft.



# AMAZING!

Fuel-proof, odorless PERFECT PAINTS cover dopes, epoxies, metals, wood, fiberglass, Monokote, styrofoam, plastics (Inc. A.B.S.) & Coverite



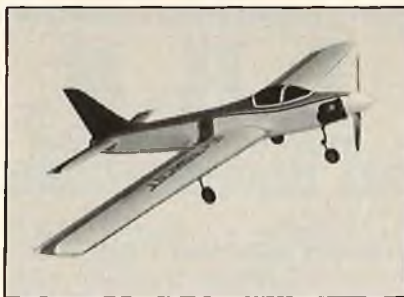
## PERFECT GLOSSY

"Can be applied by spray gun, brush or roller results will amaze you over the styrofoam wing was just great for covering absolutely no brush marks remarkable flow qualities sharpest lines we've ever seen on styrofoam high visibility painted areas looked like green plastic white covered just beautifully really the perfect paint"

R/C Modeler Magazine, August 1975

**COMING!!**

**40 SIZE MIG  
YF-16**



## F-1 TOMCAT

"Very distinctive in air," says R/C Modeler. Wing Span 64", Fuselage 49", Engine 45-60 cu. in., Weight 7 lbs.

EACH KIT CONTAINS: Fiberglass fuselage with fin in place, fiberglass belly pan, foam wings and stab, landing gear blocks, engine mount and firewall installed, complete set of plans. FREE PERFECT PAINT! Each kit has certificate good for three cans of spray or regular paint, any color.

**\$69.95**

## OTHER GREAT R&S PRODUCTS

**PERFECT GLOSSY  
NOW AVAILABLE  
IN SPRAY CANS!**

Perfect Thinner Fiberglass Boat Kits  
Fiberglass Plane Kits Camel Hair Brushes  
Sponge Brushes

**PERFECT SPRAY  
PAINTS DO NOT  
AFFECT STYROFOAM**

**CALIFORNIA**  
DAVE'S CUSTOM MODELS  
636 E. Colorado St.  
Glendale 91205

**SMITH BROS. HOBBY**  
8941 Reseda Blvd  
Northridge 91324

**ILLINOIS**  
ADDISON HOBBY MODELS  
527 W. Lake St.  
Addison 60101

**THE HANGAR**  
417 Taylor St.  
Joliet 60435

**HOBBY CITY**  
3625 W. 95th St.  
Evergreen Park 60642

**M&M RADIO MODELS**  
5544 W. 147th St.  
Oak Forest 60452

**PAT'S HOBBIES & CRAFTS**  
5730 W. 95th St.  
Oak Lawn 60453

**KANSAS**  
THE MODELER HOBBY SHOP  
845 S. Hillside  
Wichita 67211

## R&S HOBBY CENTERS

Want your shop included? Contact us

**KENTUCKY**  
HOBBY POST  
7535 Outer Loop Dr.  
Louisville 40228

**MINNESOTA**  
HUG HOBBY  
65th & Nicollet Ave. S.  
Richfield 55423

**JOHNSON'S R/C SALES**  
1720 University Ave.  
St. Paul 55104

**ST. CLOUD HOBBY SHOP**  
419 St. Germain  
St. Cloud 56301

**MISSOURI**  
J&H HOBBY HAVEN  
—49 Wharf Shopping Center  
Lake Saint Louis 63367

**NEW YORK**  
THE HOBBY HUT  
3680 Harlem Road  
Buffalo 14215

**LIDDELL PRODUCTS**  
6228 Haller Rd.  
Newfane 14108

**SMOKEY HOLLOW HOBBIES**  
Hagaman-West Galloway Rd.  
Hagaman 12086

**OHIO**  
KIRTLAND HDW. & HOBBY  
Rte. 306  
Kirtland 44094

**OREGON**  
DJ'S HOBBIES  
301 NW Kings Blvd.  
Corvallis 97330

**PENNSYLVANIA**  
DON MOHR'S HOBBYLAND  
Box 221—Main St.  
Fogelsville 18051

**TEXAS**  
E/J'S MODEL & HOBBY SHOP  
204 Memorial City  
Houston 77024

**E/J'S MODEL SHOP**  
162 Greenspoint  
Houston 77058

**WISCONSIN**  
GENE'S HOBBY SHOP  
34 S. Wis. St.  
Elkhorn 53121

**CANADA**  
CALGARY HOBBY WHOLESALE  
CANADIAN DISTRIBUTOR  
Box 3173 S.W. 8  
Calgary, Alberta

**CARL'S HOBBY SHOPS**  
6055 S. Hubert St.  
Montreal, Quebec

**MAC'S HOBBY SHOP**  
360 Croydon Ave.  
Ottawa, Ontario

**MEDALLION PRODUCTS**  
1251 —22 Road  
Richmond, B.C.

**PLANES RADIO CONTROL &  
HOBBY LTD.**  
Lower Mall-Midtown Center  
Regina, Saskatchewan S4S 0T8

**PWANJO ENTERPRISES**  
45 Washington St.  
Moncton, N.B.

**R&S HOBBY PRODUCTS, INC.** P.O. Box 61, Oak Lawn, IL 60453



## OLYMPIC MODELS SPORTSMAN

**REALISTIC LOOKING SPORT-  
AEROBATIC MODEL 40 PWD.**

- PRE-SHEETED FOAM WING
- PRE-SHEETED FUSELAGE TOP SECTIONS
- 60 IN. WING SPAN
- 620 SQ. IN.
- 5½ LBS. WITH 4 CHANNEL

Available at your favorite dealer



**MIDWEST MODEL  
SUPPLY CO.**

8328 W. 95th St. Chicago Illinois 60638 312-586-7191

**A FULL LINE MODEL DISTRIBUTOR  
SERVING DEALERS FOR OVER 30 YEARS**

## TACH-TRON

from page 144/57

These devices are also temperature stable. They are not, however, voltage stable when used in timing circuits such as half shots or monostable circuits. This problem was evaded by using hybrid circuits, which was a combination of transistors and C/MOS devices. It still kept power consumption low and gave voltage stability. It also kept the device small since most of the circuit is made up of the IC's. This also gives reliability and ease in construction.

The circuit consists of two IC's and eight transistors along with the necessary components and adjustment devices. Six of the transistors are used in the hybrid monostable multivibrators which are the rep, ref, and control monos. Another transistor is used as a read head pulse amplifier. The turn on voltage of a C/MOS gate varies from device to device. This is not so with a bi-polar transistor. A silicone device of this type comes on at approximately .5 volts input. Using a transistor at this point insured that with given magnets, headgap, and read heads, the system would be consistent from one unit to the next, as to read sensitivity. The output of the pulse amplifier Q1 is fed into a C/MOS gate to provide a fast rise time for triggering the rep mono. The rise time of the read head pulse is a function of RPM, and at low RPM, proper triggering could not be insured. Since the switching point of the gate is a function of its input level, as the output of Q1 reaches a certain level, the gate abruptly switches giving a good clean pulse output. Coupling between stages has been DC to this point, the trigger pulse to the rep mono, however, is AC coupled. This is to insure that the loss of read head continuity does not render the system completely inoperative. When being used as a governor, it would open the throttle and place it back in the control of the transmitter for manual control to a safe landing. When the system is used to control collective pitch, the pitch is being applied as a function of RPM, loss of read pulses would simulate a "no RPM condition", and the collective would go to minimum. Should this occur, the pilot can again take over control, add collective pitch and fly to a safe landing. Although this system has this redundancy, good installation techniques should be used, and wires secured against vibration and breakage to eliminate this possibility.

In the monostables, the transistor portions of the circuit employ large resistance values. This keeps the system current drain low and is possible because the transistors are connected to a high impedance load which is the gate

to page 150



# The Hobbyist

P.O. BOX 15928

In Pressley Park • Charlotte, N.C. 28210

Telephone (704) 525-2283

N.C. sales subject to 4% tax

**MAIL ORDERS  
SHIPPED DAILY**  
Add \$1.00 Handling  
for orders in  
Continental USA  
Check or  
Money Order  
Add additional 50¢  
for C.O.D. order  
(Does not apply  
to Drum Fuel)

## \* OUR OWN \* HOBBYIST FUEL

### CLUBS

Check Our Prices  
• TOP QUALITY  
• CLEAN BURNING

### SUPER SPECIAL 10% Nitro

30 Gal.  
Drum  
F.O.B.  
Charlotte, N.C. **\$109<sup>95</sup>**

	SINGLE GALLONS (Freight Prepaid)	5 GALLON CAN (Freight Paid!)	55 GALLON DRUM F.O.B. Charlotte, N.C.
5% Nitro	4 <sup>95</sup>	25 <sup>50</sup>	130 <sup>00</sup>
10%	7 <sup>45</sup>	28 <sup>50</sup>	160 <sup>00</sup>
15%	8 <sup>45</sup>	30 <sup>50</sup>	180 <sup>00</sup>
25%	10 <sup>95</sup>	34 <sup>00</sup>	225 <sup>00</sup>

**CASTOR OIL AVAILABLE ON REQUEST  
SAME SUPER LOW PRICES**

## YES, THIS IS RED-MAX FUEL USED WORLD WIDE BY

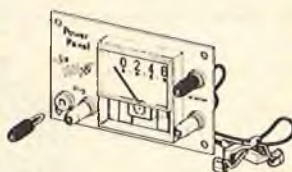
"RHETT MILLER"

"CHAMPIONS"

"DAVE PEARCE"

- Provides output for starter, glo-plug, 6V to 8V fuel pump.
- Operates from 12V starting battery.
- Amp meter to monitor plug & battery condition.
- Complete with all connecting hardware and wiring for fuel pump.
- Full instructions.
- Size 3" x 5".

One Year  
Warranty



### HOBBYIST POWER PANEL

**\$10<sup>95</sup>**

Compare At \$19.95

### NEW K & B .35RC

Try One — **\$21<sup>99</sup>**  
Reg. \$34.95

**FOR THE SPORT-MINDED FLYER — K & B QUALITY**

### Southeast Sale On Southwestern Kits

Honker .....	Reg. \$18.95	—	Hobbyist <b>\$12.00</b>
Honker Bipe .....	Reg. \$34.95	—	Hobbyist <b>\$22.00</b>
Lil Gypsy .....	Reg. \$20.95	—	Hobbyist <b>\$13.50</b>

### ANDREWS A-RAY STILL ONLY **\$27<sup>99</sup>**

### YES!!!

Still Available — Limited Quantity  
At Ridiculous Price

**Famous Brand 60 RC**



These are  
new standard  
engines designed  
for those  
large RC  
kits.  
**NO  
FOOLIN**

**\$44<sup>00</sup>**

### MILLER SPRAY OUTFITS



2-Gun — Reg. \$74.95 — Now **\$47.47**  
3-Gun — Reg. \$84.95 — Now **\$53.53**

\$1.00 ea.



### NICADS

Now's the time  
RC'ers — rebuild those  
tired old packs before  
summer flying  
**Be Safe**

500 MAH  
new cells  
with labs

### TACH-TRON

from page 146/57

inputs. The RPM adjust sets the times of both the rep and ref monos simultaneously. This makes adjustment simple and reduces required hardware by one pot, since they are not independent adjustments. Also in the monos, Q2, Q4, and Q7 are being used as diodes. When their emitters are pulled negative, their collectors also go negative. Diodes were originally used here, but they proved to be temperature sensitive and caused the mono times to drift. The saturation voltage of a transistor is not as critical to temperature variations as is a diode.

The error gate is fed into the last transistor which is used as a switch. The output of the error gate does not have enough drive to charge C6, so it is charged with R23 and R24. When Q6, the error amp turns on, it connects C6 to these two resistors. One of the resistors is adjustable, and is the sensitivity adjust. This allows you to vary the amount of charge stored in C6 with an error pulse of a given width.

The error amp is used two ways. One is inverting, the other is not. It saturates in both forms, so it is still a switch, in either form. The reason Q6 is used two ways, is to allow it to shorten or lengthen the pulse width of the control mono, depending upon the channel timings of the system being used.

R22, C7, and C8 integrate the charge on C6, making it a filtered voltage for changing the control mono timing. The feedback resistor, R33, is connected to this point also. The two motor terminals in most all servos, sets at a static 2.5 volts if the servo is not running. As it runs, one terminal is switched to 5 volts, the other to ground. If the servo reverses its direction, the opposite terminal is at 5 volts. If R33, the feedback resistor, is connected to one of these terminals, it will shift the control mono timing slightly as the servo runs. It will make the mono time shorter or longer depending on the direction of servo travel.

If the correct terminal is selected, it will shut off the servo slightly ahead of time, allowing for the servo coasting to a stop. This prevents the servo from traveling past the desired stop point. It would then

to page 154

### COX ENGINES COX/SANWA R/C SYSTEMS AIRTRONICS KITS



Send for  
complete catalog

1525 E. Warner Ave.  
Santa Ana, CA. 92702



## Buy a radio that works!

Nothing is more frustrating than buying equipment in a sealed carton and finding that it doesn't work when you get it home. It's a waste of your time and your money.

Here's our answer. Our technicians check the batteries and operation of every set *before* it is shipped to ensure that your radio is operational. After all, your radio should spend its career in the field and not in the shop.

We are centrally located for fast shipment and there are no shipping or hidden charges. Here are two quality lines of radios that are double-checked *before* you receive them.

### Cox/Sanwa...

	List	Net
#8020	\$ 79.95	\$ 64.95
#8030	169.95	139.95
#8040	264.95	209.95
#8060	319.95	239.95

### Futaba...

	List	Net
FP-2GA	\$ 84.95	\$ 68.95
FP-2E or F	139.95	109.95
FP-3FN	179.95	135.95
FP-4FN	264.95	189.95
FP-5FN	329.95	229.95
FP-6FN	339.95	239.95

NOTE: 72 MHz. Other frequencies quoted upon request.  
Send cashiers check or money order. Minn. residents add 4% sales tax. Prices subject to change without notice.

## LAKE LAND ELECTRONICS

P.O. BOX 17067 • ST. PAUL, MINN. 55117



(714)  
547-3055

## 72-Hour Turnaround

### ORBIT MICRO-AVIONICS PRO-LINE ROYAL

Genuine Parts, Factory Trained Specialists

## MILLCOTT

MILLCOTT CORPORATION  
Radio Control Electronics & Services  
1420 VILLAGE WAY, UNIT E  
SANTA ANA, CALIFORNIA 92705

Weekdays 8 AM-5 PM Saturdays Until Noon



FANTASTIC SPORT TRAINER

### COMPLETELY READY TO FLY

Just install radio & engine (not included).  
Wheels, tank, motor mount, and all accessories  
included.

### ALL BALSA (NO FOAM)

Balsa and ply fuselage and stab painted with  
K&B poxy. All balsa wing covered in monocoque.

SEE US AT THE WRAM'S SHOW  
DLR. & DIST. INQUIRIES INVITED

149.95

52" WING SPAN  
19-30 ENGINES  
3 LBS. UP WEIGHT  
2-3 CHANNEL RADIOS

Custom Model Products  
27 FULTON STREET / BROCKTON, MA 01901

## TACH-TRON

from page 150/57

have to back up, only to overshoot again. This would be "hunting". With the feedback, much higher sensitivity can be used before this occurs.

The control mono circuit contains the last adjustment device which is a pot to calibrate the governor to the individual R/C system to which it is connected. We will look at this and what happens here, two different ways. One will be before feedback is installed, the other after connecting feedback.

Assume that the governor is connected to a 1 to 2 ms auxiliary channel, 2 ms being full throttle. With the auxiliary control in full position, and the calibrate pot full CW, the control mono will be at about 2.6 ms. The control gate is connected such that the shorter pulse into it controls the servo. If the calibrate adjust is now turned slowly CCW, it will shorten the control mono time. Assume we shorten it to 1.9 ms. It is now the shorter of the two inputs to the control gate, and will have retarded the servo slightly from its full throttle position.

Now you turn cal back CW, just to the point where the servo is full throttle. This sets the control mono at about 2.1 ms. It is now ready to be shortened from this point and take control away from the transmitter as an error pulse shows up, which will shorten the mono time and automatically reduce the amount of applied power from the engine.

If a tight RPM control was not needed, sensitivity could be kept low and feedback would not be required. Figure 6 shows the block logic of the system in operation. It shows it to be a closed loop, or "ring around the rosie," as long as the engine is running. Whenever you have a closed loop, if the loop gain exceeds one, the loop becomes an oscillator. With a governor, this shows up as "hunting." If negative feedback is used somewhere in the loop, the hunting will be reduced so that higher sensitivity can be used. Another way to reduce the loop gain is to add weight to the rotor. This slows engine acceleration, which is a form of gain in the loop.

To allow tighter RPM control, electronic feedback is used. It brings about an undesirable effect however, which is what I call servo slow travel. This occurs in the static state of the system, which is with the engine not running. A second look at Figure 6 will show that without engine, the loop is no longer closed, so the feedback is not needed. Start the engine, close the loop and it is needed. This is the dynamic state of the system. What we do is install the feedback to satisfy the dynamic needs of the system, and then adjust out the undesirable side effect which it has, that of slow servo

to page 158



# KAVAN

## QUALITY PRODUCTS

### Bell Jet Ranger

AN EXCITING DIMENSION IN R/C AIRCRAFT  
WORLD'S ONLY FULLY AEROBATIC MODEL  
HELICOPTER "THE KING OF HELICOPTERS!"

UNDISPUTED WORLD CHAMPION. WINNER OF MORE CONTESTS THAN ALL OTHER  
HELICOPTERS COMBINED. THE WINNERS' CHOICE!

This precision flying model helicopter opens new doors to the R/C flyer, who knows the difference superior engineering can make. It will test your skill and add variety to your hobby and above all, give you untold pleasure and satisfaction; not to mention making you the envy of your flying field companions.

In the age of R/C helicopters, only the Kavan Bell Jet Ranger has utilized its outstanding engineering principles to perform feats of controlled flying up until now thought impossible. While other helicopters use fixed rotor pitch to lift off, the Kavan Bell Jet Ranger with throttle wide open, clutch engaged, use true-to-prototype pitch to obtain lift response.

#### SPECIFICATIONS

COLLECTIVE PITCH  
MAIN ROTOR DIAMETER 63"  
FUSELAGE LENGTH 51"

SCALE 1:6.4  
ENGINE .60

CONTROLS 4 CHAN. PROPO.  
FLIGHT WEIGHT 10 - 11 LBS  
PAYLOAD 50 %



**KAVAN MODEL AIRCRAFT INC.**  
**PHONE: 714-835-7788 1424 E. BORCHARD**  
**AVE. SANTA ANA CA. 92705**

**JUST ONE OF OVER 130 ITEMS**  
*manufactured by Kavan*  
**WRITE FOR FREE CATALOG**

#### TACH-TRON

from page 154/57

travel, when the system is in the static state. Both conditions are then satisfied.

In normal dynamic operation, the servo only makes small adjustments of the throttle, so runs are brief. It moves the control mono only a few microseconds to prevent overshoot. If the system is static, and you advance the throttle from idle to full, the servo makes a long run. The feedback from the servo to the capacitors C7 and C8 is integrated and is additive. The mono can be shifted as much as .5 ms on a long run. If the



mono was at 2.1 ms and a long run shortened it to 1.6 ms, the servo would bump into this shortened control pulse at about half travel and stop. When it stopped, motor voltage would disappear, so the charge on C7 and C8 would start returning to normal and lengthen the mono time. This would fire the servo again, get a feedback pulse and stop the servo. This start/stop procedure forms a stepping action of the servo which is what the slow travel is. It lasts until finally the servo has stepped its way to the full position.

If the control mono was adjusted just long enough with the cal pot to offset the long run change of the mono, the step-

ping action would disappear. If we set it at 2.5 ms, a long run shortens it to 2.0 in time, this will not hinder the servo travel in the static state of the system. The error pulse will show up at the desired RPM and shorten the mono time to take control of the servo. The requirements are now satisfied for both conditions.

When wired as a collective pitch control system, the cal adjust always sets the 2 ms point and the sense adjust always sets the 1 ms point. These two controls adjust the travel limits of the collective pitch servo. When changing from a 1 to 2 ms to a 2 to 1 ms mode, the sense and calibrate adjustments will

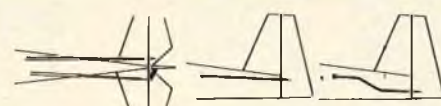
to page 160



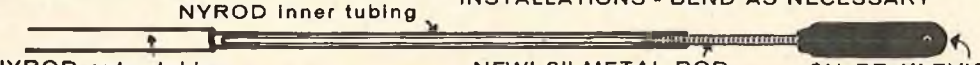
NEW...TEMPERATURE COMPENSATED

# NYROD<sup>®</sup>

**A ROD FOR ALL SEASONS**



NEW 8" METAL ROD IS PERFECT FOR THESE  
INSTALLATIONS - BEND AS NECESSARY



NYROD inner tubing  
NYROD outer tubing  
NEW 8" METAL ROD  
SU-PR-KLEVIS

**SU-PR-LINE  
PRODUCTS**

PLAINFIELD, ILLINOIS 60544



# are you ashamed of the finish on your model ?



**EDSON has published a 32 page, Full Color, Step by Step method...**

**Written by DAN DE LUCA WINNER OF THE 1976 TOLEDO SHOW**

**Send Check or Money Order to:**  
**Edson Enterprises Inc.**  
228 Franklin Ave., Nutley,  
New Jersey 07110

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
State \_\_\_\_\_  
Zip \_\_\_\_\_



**ENTERPRISES INC.**  
228 Franklin Avenue  
Nutley, N.J. 07110  
(201) 651-2310

**Get your copy \$4.95 NOW**

**If dealer cannot supply you, order direct.**

**RC BUYERS CLUB**



3804 W. 81st St., Chicago, Ill. 60652

**THE R. C. BUYERS CLUB HAS A COMPLETELY NEW POLICY IN WHICH EVERYONE CAN BUY FROM US WITHOUT "JOINING" OR BUYING A MEMBERSHIP AND STILL RECEIVE BETTER THAN AVERAGE MAIL ORDER PRICES.**

**SEND US YOUR NAME, ADDRESS AND ZIP FOR COMPLETE INFORMATION.**  
(Paid Memberships Are Still Honored)



**A FUEL THAT'S A LITTLE DIFFERENT BUT A LOT BETTER**

**COOL POWER FUELS ARE COOL CLEAN BURNING FUELS THAT LET YOUR ENGINE PERFORM ITS BEST AND LAST LONGER. THEY CONTAIN ALL THE TIME HONORED INGREDIENTS PLUS A FEW DIFFERENT FEATURES THAT GIVE THEM A DIFFERENT EDGE . . .**

- **ANTI-FOAMING**
- **WETTING ACTION** THAT ALLOWS THE LUBRICANT TO FLOW MORE FREELY INTO BUSHINGS AND BEARINGS
- **SUPERIOR FILM STRENGTH AND ANTI-WEAR QUALITIES** THAT CUT FRICTION AND ALLOW MORE POWER WITH LESS NITRO
- **MILD DETERGENT ACTION** THAT HELPS PREVENT VARNISH EVEN WITH A MUFFLER

	(Gallon)	(Drum)
FAI	6.95	155.00
5%	7.95	165.00
10%	8.95	175.00
15%	9.95	185.00
25%	11.95	205.00

**COOL POWER IS OFFERED WITH A CHOICE OF LUBRICANT PACKAGES . . . TOTAL SYNTHETIC OR A CASTOR SYNTHETIC BLEND.**

MANUFACTURED BY **MORGAN'S HOBBY ENTERPRISES INC.**  
200 WEST LEE STREET  
ENTERPRISE, ALABAMA 36330

PHONE (205) 347-3525 (DAY)  
(205) 347-8221 (NIGHT TO 8 P.M.)

## TACH-TRON

from page 158/57

trade roles. As an example, the sense adjust always sets the 1 ms end of the pulse. On a 1 to 2 collective system, this would be the collective pitch start setting. On a 2 to 1 collective system, this would be the full collective limit. The RPM adjust is used to set the RPM at which full collective will be attained in both modes.

The error gate and the control gate are used as a positive "OR" or a negative "AND" gate, depending on how the system is wired. Inputs are taken from the monos in either its true form or its compliment to satisfy the nand/nor needs. This provides the capability of the 1 to 2 or 2 to 1 connections. It was stated that the error gate, when connected for throttle control, would product an error pulse when RPM exceeded the system setting. It was also stated that with the gate connected to the compliment of the monos, the inverse would be true and an error pulse would exist (decreasing with RPM), and would disappear at the RPM setting. The same technique is used in the connections of the control gate. When connected for throttle 1 to 2, the shorter pulse in has control of the output of the gate. When connected for collective 1 to 2, the inverse is true and the longer pulse input has control of the gate. This is why throttle can be manually retarded or collective can be manually added.

The last two gates are used as pulse inverters to provide for use with either a positive or a negative pulse system. If one sums up the various possible forms of application of the system, he will find as described thus far, eight possible applications. In addition to these, there are four other possibilities. If the above mentioned inverters, the control mono, and the control gate were eliminated, the clocking portion of the circuit could be used to control a servo directly by means of the feedback point in the servo circuit. The 68K resistor which is attached to the cal adjust pot would be changed in value to suit the needs of the servo circuit. The clocking portion of the circuit, with its four possible forms could then provide the following — a negative or a positive going error voltage for throttle mode and a negative or positive going error voltage for collective mode. It could be internal to the servo and be a self-contained system if desired.

The total current drain of this system is only 380 microamps. This is well below one half mill. The supply voltage can vary from 2.5 volts to 8 volts without excessive pulse width changes. To achieve operation at a voltage as low as 2.5 volts, the IC's have to be selected. Those who are familiar with C/MOS de-

to page 162





We stock a complete assortment of parts and accessories for most popular helicopters — Kavan, Schluter, Revolution . . .

**Special!**

### Kalt Baron Kit

reg. \$229.95 **SALE \$149<sup>95</sup>**

Revolution	\$185.00
Revolution with K&B eng. and muffler	224.00
Graupner 212 with eng. and muffler	585.00 495.00
Schluter Heli-Baby	265.00 189.95
Schluter Super Baby	299.95 229.95
Kalt Jet Ranger	395.95 249.95
Super Baby Conversion Kit	94.95 84.95

Order today! Supplies limited on specials. Master Charge, BankAmericard and COD accepted. Add \$6.00 for helicopter kits. Excess refunded. Ohio residents add 4% sales tax. Send for free mailer.

## White's Hobbies

Box 30828

Gahanna, Ohio 43230

Phone (614) 475-4514

## GET A HEAD!

**Dieselize your Cox engine with a Davis conversion kit**

- No glow plugs
- More power
- No battery & leads
- More economy
- Easily throttled
- Less noise



Conversion in seconds. No tools required. Primarily for TD and Medallion .049-.051 engines but may also be used with other models. Introductory price **\$9.95** including 1/2 pt. fuel.

Add \$1.50 postage and handling. Conn. residents add 7% sales tax. Check or money order. No COD.

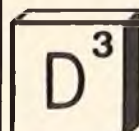
1 pt. diesel fuel **\$3.50**

1 qt. **\$5.00**

plus \$1.00 postage and handling.

Descriptive literature **25¢**.

Dealer inquiries invited.



**DAVIS**

**DIESEL**

**DEVELOPMENT**

New  
.020  
Kit  
**\$9.95**

Box 141, Milford, Conn. 06460

Phone: (203) 877-1670

## TACH-TRON

from page 160/57

vices are aware of the fact that these devices, as received from the manufacturer, have a transfer voltage range of 33% to 67% of the supply voltage. This variation is possible from device to device. This circuit was tested with two IC's which switched at 40% of the supply voltage. With these two IC's, the circuit operated on a supply as low as 2.0 volts. This means that with selected devices, operation can be guaranteed with the loss of one cell in the flight pack and the other three nearly depleted.

The Tach-Tron was put through rigid bench testing. A system simulator was built to operate the device dynamically on the bench. A precision Tach was constructed so that performance could be observed. After calibrating the governor to 1000 RPM while in operation, it was sprayed with a freon circuit coolant. The total circuit board was frozen until it was completely covered with frost. With a change from room temperature to about -50°C, the RPM drifted 10 RPM. This is 10 parts per 1000, or about 1%.

Using the same test set-up, voltage stability is checked. The unit is powered with an adjustable power supply. The device is calibrated to 1000 RPM, while the supply is set to 2.5 volts. The supply is then increased to 8.0 volts. This is over a 200% voltage increase, but the RPM change is again less than 1%.

I will let the electronic circuit buffs ponder this one. There is no voltage regulation in the circuit. The answer is before your eyes, when you look at the schematic.

The last part of the circuit to be discussed, is the noise filter. D1, C11 and C12 form the filter. This is to keep servo motor noise on the battery pack from disturbing the three monos in the device. As a motor runs, the battery voltage makes a sudden drop because of the high start current of the motor. D1 disconnects the governor from the battery, and the circuits operates on the charge stored in C11 and C12. The actual supply voltage on these capacitors is a smoothed average of the battery voltage plus motor noise within the system.

Several techniques were evaluated in the early stages of the Tach-Tron development. The logic of the Tach-Tron was considered to be the most versatile. The circuit to accomplish the utilization of the logic, proved to be a difficult one, to end up with the specs of the final version.

The alternate circuit which would accomplish 50% as much, governor only, was breadboarded. It contains 3 IC's, and four transistors. Using the same logic, Q1 was still the read head amp.

to page 164

# Futaba

## PROPORTIONAL SYSTEMS

72MHz

FP-6FN	6-CHANNEL	221.00
FP-5FN	5-CHANNEL	211.00
FP-4FN	4-CHANNEL	172.00
FP-3FN	3-CHANNEL	116.00
FP-2E	2-CHANNEL	92.00
FP-2F	2-CHANNEL	92.00
FP-2GA	2-CHANNEL	59.00

### SERVO:

FP-S10, FP-S14	52.95
FP-S12	24.95
FP-S8	31.95
FP-S6, FP-S6L, FP-S7, FP-S7L, FP-S11	29.95

COX	.049 R/C Golden Bee	8.00
FOX	.36 R/C Engine	19.80
K&B	6.5CC (40 R/C) Engine	55.45
McCoy	.29 R/C Engine	19.80
AHM	Heat Gun	15.45
Dremel	281 Moto Tool Kit	34.45

## RPS HOBBIES Box 272

EAST HAMPTON, CT. 06424

CONN. ADD 7% FOR SALES TAX. Add \$2.50 to total to cover postage, handling, and full insurance. Send payment in Money Order or Check only (Personal Checks may be delayed to allow for clearance).

# DON'T GAMBLE

*On covering your next model Use fantastic new Balsarite.*



- Crystal Clear Liquid
- Brush or Spray
- Protects Wood Models from Moisture
- Makes Coverings Stick Better (especially iron-ons like Monokote, or Silk & Tissue)
- Eliminates Wood Warp, Cover Sag, Foil Creep
- Makes All Models Stronger (planes, boats)





# AT LAST, a fleet of TRF models at the lowest price ever!

\*TRULY READY TO FLY · ALL YOU ADD IS ENGINE, RADIO AND LOVE.

**GIFT! A PAIR  
OF GENUINE "BANDERILLAS"  
WITH EVERY MODEL...**



COMPENSATOR

ASK NOW FOR YOUR  
COLORFUL

**FREE  
BROCHURE.**

**NOW** "ATLAS"  
ALSO  
AVAILABLE



SUPER KAOS

**THERE WILL NEVER  
BE SOMETHING LIKE A HANDMADE BALSA PLANE!**

- HANDMADE OF PREMIUM BALSA WOOD. NO PLASTIC PIECES.
- PAINTED IN TWO COLORS, HAND POLISHED TO HIGH GLOSS.
- HIGH QUALITY HARDWARE (HINGES, HORNS, PUSH RODS, ETC.) ALREADY INSTALLED.
- LANDING GEAR INSTALLED IF FIX, OR PREPARED IF RETRACTS.
- OPENING FOR ENGINE ALREADY TRIMMED.
- FUEL TANK INSTALLED INCLUDING LINE AND VENTS.
- CANOPY, IF PLASTIC, GLUED IN PLACE WITH ATTRACTIVE DUMMY PILOT OR YOUR CHOICE.

WE SEND YOUR MODEL TO YOUR DOORSTEP IN A STURDY BOX 64 X 24 X 12 IN. VIA TRUCK OR CARRIER OF YOUR CHOICE. WITHIN ONE WEEK OF RECEPTION OF YOUR ORDER.

FILL THE ORDER FORM AND SEND JUST \$60.00 AS DEPOSIT. PAY \$247.00 PLUS FREIGHT (C.O.D.), WHEN YOU RECEIVE YOUR TRF MODEL. WE DON'T CHARGE ANY EXTRAS.

MEXAMODEL, THE PEOPLE THAT HAVE BEEN COMMERCIALY PRODUCING HANDMADE MODEL PLANE FOR MORE THAN 15 YEARS.

**NEW PRICE \$247.00**

MAKE YOURS THE  
BENEFITS OF THE  
RECENT CHANGE  
IN PARITY OF THE  
MEXICAN PESO

SR FALCON

ORDER FORM (Please print)

To: MEXAMODEL, Apdo. Postal 381, Colonia del Valle, N. L., MEXICO

☐ Enclosed money remittance (Bank Draft) for \$60.00 to cover the deposit on model.

Name of Model \_\_\_\_\_ Retracts? No ☐ Yes ☐

☐ SEND FREE BROCHURE.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State & Zip \_\_\_\_\_

BLUE ANGEL

• BLUE ANGEL

• CHEROKEE

• COMPENSATOR

• DING BAT

• DIRTY BIRDY

• SR FALCON

• MACH I

• RCM TRAINER

• SUPER KAOS

• SUPER SICROLY

• ALL FOR .60 ENGINE

**REMEMBER: WE TAKE CARE AND PAY ALL CUSTOMS RED TAPE.**

## TACH-TRON

from page 162/57

The rep and ref monos was a NE556, the control mono a NE555. These have a positive output, so to get the correct error gate function, a 4011 is used. The other three gates perform the correct inverts and control gate function. The error amp was a transistor, and the integrator had to be followed by a complimentary pair of emitter followers, because the control voltage input on the NE555 is a current hog. It also sets at an offset at about 67% of VDD. This required two different level shift set-ups to get the feedback to work correctly in the 1 to 2 and 2 to 1 versions. The emitter followers, being at the integrator output, also caused temperature problems.

The unit also required about 17 mills. In the final analysis, it seems that the direction I went was the best with the current state of the art.

This completes the first of a three part series about the Tach-Tron. The next part will cover a kit assembly. The kits, as well as wired units, are available from Royal Electronics, Denver, Colorado. □

## HALF-A STAND-OFF SCALE

from page 47/45

9. Option

10. Option

12.1 List of Optional Maneuvers

1. Three Inside Loops
2. Three Rolls (barrel or axial)
3. AMA Horizontal Figure Eight
4. Immelman turn
5. Cuban Eight
6. Three Turn Spin
7. Stall Turn
8. Inside Snap Roll
9. Square Inside Loop
10. 4 Point Roll

13. **Flight Scoring.** Maximum total flight score is 100 points.

13.1 All maneuvers and scale options are to be scored from zero to ten points.

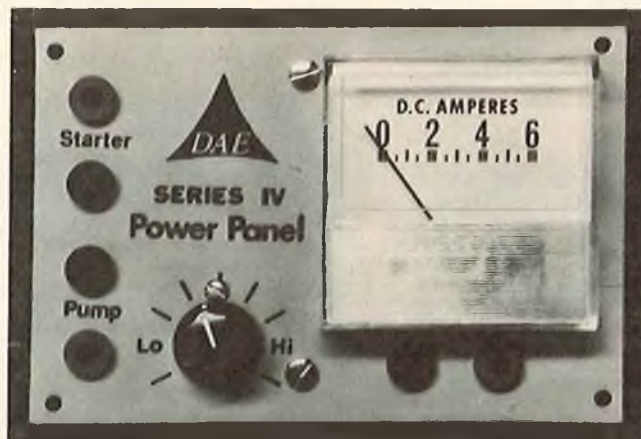
13.2 No maneuver or scale operation will receive an automatic maximum score. All will be judged in relation to their scale-like qualities.

13.3 In the event one or more engines of a multi engine model fails during flight, the multi engine score will be based on the contestant's ability to continue flight. If the contest can continue to do the maneuvers or operations, he will continue to receive flight points for them.

14. **Official Score:** The official score shall be the total of static points (100 pts. maximum) and the average of the best two flight scores (100 pts. maximum). □



## One Battery Does It ALL! SERIES IV POWER PANEL



### -TRANSISTORIZED SOLID STATE CIRCUITRY-

POWERS any starter, fuel pump, and glow plug  
FAST CHARGE your transmitter and receiver at the field  
ALL from your 12 volt starter battery

- SOLID STATE CIRCUITRY
- VARIABLE GLOW PLUG OUTPUT
- VARIABLE FAST CHARGER OUTPUT
- AMMETER MONITORING OF PLUG & CHARGER
- POST CARD SIZE FOR EASY MOUNTING
- HARDWARE AND INSTRUCTIONS INCLUDED

**Only \$34.95**

**See It At Your Favorite Dealer Now!**

SEE DEALER FIRST. If unavailable, order direct including \$1.00 for handling. Indiana residents add 4% sales tax.

SEND FOR FREE CATALOG



**DA Enterprises**

BOX 335  
HAUBSTADT, INDIANA 47639  
Phone No. (812) 768-6029



from page 35/33

months, was on his way overseas once again.

Major Boyington was assigned to Marine Aircraft Group Eleven of the First Marine Aircraft Wings and became Commanding Officer of Squadron 214 after a short tour in the Solomons with another airborne unit. The new squadron was made of a group of casualties, replacements, and green pilots and was dubbed "The Black Sheep" squadron.

It is here that the NBC network series "Baa Baa Black Sheep" takes over the story of Gregory "Pappy" Boyington starring Robert Conrad in the leading role. This is truly an excellent series and one that is a "must" for any aviation enthusiast. Technically, it comes as close as possible to the actual events of the "Black Sheep" squadron under the direction of "Pappy" Boyington.

R/C Modeler Magazine is indebted to the National Broadcasting Company and Universal Studios for their cooperation in the preparation of this article and the accompanying photographs. Our congratulations also to Universal Studios for the production and presentation of one of the best series to be aired in a number of years. □

### SOARING

from page 30

niently located on the sides of the case for easy one-hand operation. The display switch turns the readout off to conserve battery power during longer flights, or shows the actual counting process for sequential and split time functions.

After an event is finished, pressing the start/stop button alternately shows the time in each counter.

With the sunscreen in place, reading in direct sunlight presents no problem.

This electronic stop watch can be easily assembled in a couple of evenings even by a novice builder.

Contestants came from everywhere, Cocoa Beach, Tampa, St. Petersburg, Melbourne, Orlando, Ft. Myers, Atlanta, to page 168

## "QUICKER F-500" RACE-SPORT



- HARDWARE - MACHINED PARTS - BALSA/PLY
- ILLUSTRATED FULL-SIZE PLANS - FOAM CORES/FULL SKINS
- 50" SPAN - 500 AREA - 3.5 LB. - 20/40 POWER



**KREIDEL ENGINEERING**  
Box 1783, Whittier, CA 90603

\*Checks, C.O.D.'s OK • Calif. residents - 6% tax  
Add \$1.50 shipping cost  
WHEEL, AXLE, PANTS KIT - \$6.50  
(Dealer inquiries invited)





# HARDWOODY



Wingspan: 48 in. Area: 360 sq in.  
Engine: .15-.19 Channels: 2-3  
Materials: pine, birch, spruce, bass-wood.

Suggested retail: \$ 26.95

 **BAUER MODEL AIRCRAFT**  
1035 WILLOW LANE, HOWELL, MICHIGAN 48843

A handsome, good flying plane that is satisfying to build and fly. The strength of conventional hard and soft woods and the lightness of stringer and former construction result in a crisp, non-critical flyer that can survive hard landings and rough terrain. The plane uses no balsa.

See your local dealer first. If unavailable order direct. Mich res. add \$1.08 sales tax.



*C.D. graciously awards last place trophy at Skyhawks meet to Dan Donaldson.*

## SOARING

from page 166/30

and even one stray from Indiana. Those who failed to show were members from nearby, who, after one look at the weather, apparently said to themselves, "So much for that, they'll never get off the ground today." Despite this, the Second Annual "Skyhawk Sailplane" contest of West Palm Beach, Florida, got off the ground with twenty-three contestants, all of whom entered wholeheartedly into the friendly competitive spirit that prevailed throughout the contest.

There were three flights in each of the two tasks chosen for the contest. Those tasks were IIA and III as described in the AMA contest book. Task III was flown first, after which lunch was swallowed whole and Task IIA was attempted. The entire time the contest went on, the skies were threatening and their field consists of a sod farm, which consists of acres and acres of nothing but acres and acres!

The rain could be seen all around but not one drop fell on the contest site. Everything went off without a hitch. A large amount of credit was due to the new winches built by the club from the plans in RCM and designed by Chet Tuthill.

During the lunch break, a group of "Skyhawk" pylon racers gave an exhibition of power flying with their Quickie 500's. Despite the strong partisanship of power versus soaring, the power flyers went all out to make this a fine exhibition.

The winners in Task IIA were Rick Edmonds from Baltimore, First, while Second Place went to his brother, Dave Edmonds, of the "Skyhawks". The third slot went to Stan Richmond of the Cocoa Beach contingent. Task III was won by Stan Pfost of the "Orlando Buzzards".

Second Place went to our last years champion, Johnny Gunsaulus, while Third Place honors were taken by John Agnew from Ft. Myers.

The latest W.I.N.G.S. newsletter says they are up to 47 members, and plan to grow even stronger. They were represented at the Soaring Nationals by

to page 170

## STICKY HINGES?

TRY

**HINGE FREE!**

(Bearing Lubricant)



Price: \$1.50  
Per Bottle  
Post Paid



**MR. G's PRODUCTS & SUPPLY**

P.O. Box 161

**Marysville, Michigan 48040**

DEALER INQUIRIES INVITED

## THE KRAFT .61 CU. IN. ENGINE IT'S A WINNER!



IT'S A WINNER IN COMPETITIVE FLYING, THE PROVING GROUND FOR ENGINE PERFORMANCE.  
IT'S A WINNER WITH THE DAY-TO-DAY SPORT FLYER FOR ITS LONG LIFE AND READILY AVAILABLE PARTS AND SERVICE.  
QUALITY ASSURED. AMERICAN MADE.

**KRAFT**  
SYSTEMS, INC.

Write for free catalog, Dept. C  
450 WEST CALIFORNIA AVENUE  
P.O. BOX 1268-VISTA, CALIFORNIA 92083  
World's Largest Manufacturer of Proportional R/C Equipment



## THE M.E.N. TRAINER STORY

The M.E.N. TRAINER was specifically designed for the absolute beginner in Radio-Control flying. It is by far the best trainer available on the market today. Over four years of extensive design engineering and development have led to its proven success. Its unique design, construction and flight characteristics makes your introduction to R/C flying an enjoyable experience. Even seasoned flyers have found the M.E.N. TRAINER a truly exciting and relaxing plane to fly. The M.E.N. TRAINER enables you to learn radio-control flying with minimum supervision and light training time. Its slow flight and ease of command virtually allows hands-off control, while its distinctive size and shape assure you maximum visibility and ease in recognition of plane attitude when flying beyond normal ranges. Beginner... or seasoned pilot. Choose the M.E.N. TRAINER and see what flying R/C is all about.

**FEATURES:** Under-cambered wing with ample dihedral for slow, stable flight. The M.E.N. Trainer flies 8-10 M.P.H. • Trainer will recover hands-off from any altitude in 100 feet or less of altitude loss when properly trimmed—allows beginner to re-orientate himself • 3 1/2 lb. Flying weight with average radio-control sets 13 oz./sq. ft. Wing Loading • Uses

.15-.25 engine for fuel economy • Large, roomy fuselage for ease of radio installation...old or new • Sturdy Plywood-Spruce-Balsa construction withstands beginner abuse • For those first landings...the M.E.N. Trainer will virtually land itself with little input required from the beginner pilot.

**M.E.N. KIT:** Light Plywood-Spruce-Balsa construction for durability and lasting performance • Precision die-cut ribs, fuselage sides, bulkheads, dihedral braces, etc. for quick assembly and ease of construction for the beginner • Pre-formed landing gear and brace. Wrapping wire included • Easy to follow plans and instructions including a Monokote cutting guide for the most economical use of covering material • Generous hardware package included with each kit • Quick building—Approximately 12-25 Hours

**M.E.N.**  
Model Engineering of Norwalk  
54 Chestnut Hill • Norwalk, Connecticut 06851

DEALER AND DISTRIBUTOR INQUIRES INVITED



## SOARING

from page 168/30

Donna Deis, Margaret Gill, Barbara Henon, Joan Nolte, Barbara Robinson and Lila Stamm.

There were a total of 26 teams entered and they placed 24th. They would have liked to do better, but they were not last.

Jack Allen of the South Bay Soaring Society, sent us his observations of "man-on-man" type contests and it does have some merit.

"It takes twice as many people to score. Impound call-up takes 3 people, while normally one can do the job. A winch starter, plus one additional person, are required full time. Making a new flight order between rounds, based on matching scores, takes approximately 20 minutes. Blind matrix order may pit an expert against a fledgling in the same heat."

Well maybe "man-on-man" (person on person) may not be the total answer to unequal flying conditions, but some like it, while others don't, but it has created a healthy interest in soaring competition.

Good life.

## RACING AT RANDOM

from page 20

ship race was held at Bakersfield, California, this year. This race weekend consisted of the sixty best Formula I pilots from all over the country. To qualify to race at this contest, you must fall within one of the following:

(a) One of the top 10 at the 1976 Nationals.

(b) Be within the top 20% point total-wise in each district.

(c) An official in the N.M.P.R.A.

to page 175

**K&B: w/multiflier**  
19R/C 29.95  
3.5cc outboard 59.95  
3.5cc (21) R/C 44.95  
40R/C Series 75 34.95  
40R/C w/pump 56.95  
40R/C marine 49.95  
6.5cc (40) SR II 57.95  
61R/C 49.95  
61R/C w/pump 64.95  
35R/C (new) 24.95

**FOX:**  
15R/C SR BISH 21.95  
19R/C 18.95  
25R/C 18.95  
29R/C 19.95  
36R/C 19.95  
40R/C SR BUSH 27.95  
45R/C SR BUSH 27.95  
60 Eagle 38.95  
60 Hawk 57.95  
78R/C 55.95

**Also OS Max, Super Tiger, & Webra engines.**  
—ACE—  
Dick's Dream 9.95  
Ace High Glider 11.95  
Whizard 11.95  
Upstart II 10.95  
All Star Biplane 14.95  
Pacer 11.95  
Mach None 11.95  
Aero. Strike 17.95  
Super Pacer 19.95  
Littlest Stick 2.95

—ANDREWS—  
H-Ray 24.95  
Aeromaster Too 48.95  
Trainermaster 34.95  
A-Ray 30.95  
S-Ray 19.95  
Sportmaster 44.95  
Mini-Master 27.95

—ASTRO FLIGHT INC.—  
ASW-17, (glass) 53.95  
Monterey 23.95  
Malibu 16.95  
Fournier 23.95  
ASW-15 36.95  
Bushmaster 26.95  
1/2 A Mini Starter 12.95

### OVER 300 DIFFERENT KITS & ALL R/C ACCESSORIES IN STOCK

<p>—BRIDI— Dirty Bird 60 54.95 Super Kaos 60 47.95 Kaos 42.95 Super Kaos 40 34.95 RCM Trainer 60 40.95 RCM Trainer 40 32.95 T-20 26.95 RCM Basic Trainer 26.95 RCM Sportster 24.95 15-500 24.95 Tweedy Bird 19 26.95 Twin Floats 19.95 Dirty Birdy (glass) 78.95 Shrike, (glass) 126.95 P-51D, (glass) 89.95 Brown B-2 89.95 Trainer 10 18.95 Dirty Birdy 40 42.95 —CASS ENGR. CO.— Pulsar Bipe 77.95</p> <p>—CRAFT AIR— Drifter 16.95 Windrifter 30.95 S.D.100 39.95 Sallare 79.95</p> <p>—CARL GOLDBERG— Falcon 56 17.95 Sr. Falcon 32.95 Skyark 56 20.95 Shoestringer 28.95 Skyline 62 32.95 Ranger 42 (ARF) 15.95</p> <p>—HOUSE OF BALSA— P-51 Mustang 17.95 Nomad 10.95 Nomad II 14.95 1/2 Midg. Miss Dora 26.95 Pietenpol 36.95 1/4 A ME109 18.95 1/4 A P-39 18.95</p> <p>—JEMCO— PT-19 36.95 P-51D 37.95 ME109G-2 37.95 F.W. 190D 38.95</p> <p>—COVERITE— Permagloss 5.95 Super Coverite 4.95 Silkspan 38x54 4.95 Silkspan 27x38 2.49</p>	<p>—JENSEN— Das Ugly Stick 39.95</p> <p>—LANIER— Rebel 64.95 Comet II 38.95 Comet 35 34.95 Jester II 54.95 Invader 57.95 Caprice 45.95 Cessna 40.95 Transit 29.95 Pinto 30.95 Slo Comet 37.95 Hawk 23.95</p> <p>—MACO— Jet Star 39.95 Vega 38.95 Simplex Trainer 26.95 Tiger Cat 36.95</p> <p>—MARKS MODELS— Wanderer 14.95 Windward 21.95 Windfire 27.95 Bushwacker 27.95</p> <p>—MIDWEST— Attacker 24.95 Das Lil Silck 16.95 Tri Squire 15.95 Lil Tri Squire 11.95 Lil T Glider 14.95 Cessna Cardinal 17.95 Super Chipmunk 17.95 Mach 49.95 Sweet Silk 23.95 Cardinal Squire 44.95 Strikemaster 37.95 Pitts Special 54.95 Silent Squire 22.95 East Flyer 61.95</p> <p>—M.E.N.— M.E.N. Trainer 2095 Buzzard Bombshell 36.95</p> <p>—BUD NOSEN MODELS— Aerona Champ 9' 74.95 Cessna 310 Twin 127.95 Mr. Mulligan 9' 104.95 Citabria 9' 74.95 Gere Sport 8' 98.95 J-3 Cub 89.95</p> <p>—MRC— Piper Cherokee RTF 219.95 Cessna RTF 179.95 Cessna w/Radio RTF 369.95</p>	<p>—DAVE PLATT— Splitfire 54.95 N. American T28 54.95 FW-190 54.95 Waco UMF-3 54.95</p> <p>—PRATHER PRODUCTS— Sport Panther 69.96 Pole Cat Trainer 19.95</p> <p>—R.C. KITS— Heinkel-51 48.95 F-7F Tigerclaw 89.96 F-100 Super Sabre 59.95 S. Hunter II(60) 48.95 S. Hunter II(40) 37.95</p> <p>—SIG— Piper J-3 26.95 Yak 18 49.95 Zlin Akrobat 39.95 Aerobipe 14.95 Clipped Wing Cub 26.95 Ryan ST 49.95 450 Mustang 24.95 Citabria 35.95 Kadel 21.95 Komander 30.95 Liberty Sport 47.95 Skybolt 43.95 Kougar 31.95 Klipper 13.95 Super Sport 12.95 Sup. Chipmunk kbrc 40.95 Sig Minnow kbrc 21.95 Cessna 150 kbrc 46.95</p> <p>—SKY GLASS— Vertigo II 39.95 Phoenix 6 39.95</p> <p>—SOLARCRAFT— Glasslugel 604 68.95 Diamond 62.95 Libelle 55.95 Centurion II 39.95 Magnum 12 89.95 Skybolt 66.95</p> <p>—SOUTHERN R/C— Delux Tiger Tail 77.95 Delux Sweettail 77.95 Delux Compensator 77.95 Std. Tiger Tail 54.95 Std. Sweettail 54.95 Std. Compensator 54.95 Bobcat 35.95 Galor-Flea 39.95 Atlas 69.95 Alley Kat 29.95 Six Shooter 7.95</p> <p>—SOUTHWESTERN— Honker Biplane 23.95 Honker 13.95</p> <p>—GLEN SPICKLER— Quickie 500 28.95 Quickie 200 14.95</p> <p>—JACK STAFFORD— Sperry Messenger 37.95 EAA Acro Sport 44.95 B-24 Liberator 129.95 Tomkitty MK 15 27.95 Tomkitty MK 40 37.95 Chipmunk 32.95 P-51 w/Retracts 44.95 P-39 w/Retracts 44.95 S. Buccaneer 29.95</p> <p>—STERLING— PT-17 54.95 Fokker D-7 50.95 Lancer 24.95 Fledgling 23.95 Lancer SL-62 32.95 Citabria 24.95 Gatariator 36.95 Rimfire 23.95 Stenson Reliant 36.95 Waco S.R.E. 45.95</p> <p>—SURE-FLITE— Deadbeat Glider 44.95 Cessna 182 (Foam) 22.95 Eye Soar 12.95 Baby Birdie 9.95 Piper Cub (Foam) 22.95 Foam Floats (lg) 10.95</p> <p>—TOP FLITE— Tauri Trainer 23.95 Taurus 36.95 Top Dawg 12.95 Headmaster 15.95 Kwi-Fil III 41.95 SESA 41.95 Nobler 25.95 Confender 31.95 P-51 Mustang 38.95 P-40 Warhawk 41.95 P-39 Airacobra 41.95 P-47 Thunderbolt 55.95</p> <p>—VK— Fokker Triplane 42.95 Cherokee Babe 24.95 Cherokee 42.95 Corben Super-Ace 26.95 Sopwith Camel 41.95</p> <p>—WING MFG.— Drone 29.95 Love Machine 29.95</p>	<p>—RADIO'S— <b>KRAFT:</b> KP3C 164.95 KP5C 279.95 KP7C 379.95 KSE 219.95</p> <p><b>MRC:</b> Model 765 219.95 Model 775 234.95</p> <p><b>WORLD ENGINES:</b> 7ch.Mk.II Expert 249.95 5ch.Mk.II Expert 234.95</p> <p>—WOLFE-PAK— Toad 26.95 Tadpole 19.95</p> <p><b>FUTABA:</b> FP2GA 64.95 FP5FN 224.95 FP6FN 231.95</p> <p>—HELICOPTERS— Du-Bro: Whirlybird 505 99.95 Tristar Scorpion 179.95 Shark.60 259.95 Hughes.60 259.95 .60 Conversion 59.95</p> <p>—SAVE— AAA Balsa: 1/16x3 .42 1/16x4 .66 1/8 x3 .58 3/32x4 .76 3/16x3 .73 1/4 x4 1.16 1/4 x3 .80 3/8 x4 1.48 Over 150 different sizes 2" to 6" sheets 36" &amp; 48" long. Also sticks &amp; more.</p> <p>—GE BATTERY PACKS— Filite Pack 4.8v. 500 MA 9.95</p> <p>—ZAP— 1/2 oz. 3.49 1/4 oz. 2.25</p> <p>—PEERLESS— Pop Buggy 64.95 Racing Cycle 55.95 Amphibious Buggy 94.95 Newport Sail Yt. 41.95 Capri Cabin Cr. 36.95</p> <p><b>AMBROID IN QTS.</b> 3.75</p> <p>For fast service please pay by certified check, money order or cash.</p>
--	---	---	--

### MUTCHLER'S HOBBIES

217 E. 5th St. New Albany, Ind. 47150  
PHONE 812-944-2771

HOURS: MON. 9:00-5:00  
TUES. THRU FRI. 9:00-5:30  
CLOSED: SAT. & SUN.

POSTAGE HANDLING \$2.00  
OVERSIZED PACKAGES EXTRA  
C.O.D. \$ .85

SEND FOR FREE LISTINGS.  
WITH ALL KITS, RADIOS,  
ACCESSORIES & PRICES.



# The sky's the limit with Dremel Moto-Tool.

The way you service your plane on the ground has everything to do with the way it performs in the air. That's why you need a Dremel variable speed Moto-Tool in your "hanger". Whether you're sanding, carving, routing or drilling wood, fiberglass and foam parts, or shaping nose blocks and wing fillets,

Moto-Tool lets you do it with real precision. Just dial the speed to fit the job. Fast speeds for hard materials — slow speeds for soft materials. See your hardware or hobby dealer today. Dremel Manufacturing Division of Emerson Electric Co., Racine, Wisconsin, 53406. Dept. T29-7B



Constant speed Moto-Tool kits from \$29.95 to \$49.95.  
Variable speed Moto-Tool kits from \$54.95 to \$59.95.



Dremel's variable speed Moto-Tool gives you fingertip control — 5,000 to 25,000 RPM.

**DREMEL®** Helping families to create — together.

## RACING AT RANDOM

from page 170/20

The racing was fast and close with a large number of mishaps. Terry Prather took 1st with his Prather Products Tony and X40. Terry's fastest time was 1:16.6. John McDermott flying an X40 powered Prather Tony took 2nd honors with a fast time of 1:17.3. Third spot was

won by Smiling Jim Jensen, also with a Prather Tony and X40 with a best time of 1:15.6.

The fastest time of the meet was a 1:15 flat turned in by young Steve Sica with his D & S Models X40 powered Rickey Rat.

Congratulations to Terry, John, Jim, and Steve on a job well done. There will be a complete and detailed report on this race in a following issue. □

## RADIO SPECTRUM

from page 19/16

..... high side at 53.555. My image is 455 KHz above that on 54.01. The 53.71 repeater frequency is the closest to me. However, many RC systems put the image on the low side, to page 176



## SAN ANTONIO HOBBY SHOP

2550 West El Camino Real - Mountain View, California 94040



PHONE  
415-941-1278

**ARE WE AMERICA'S  
LARGEST  
HOBBY SHOP?  
TRY US!**

## HUGE R/C DEPT.

Airplanes, Cars, Boats,  
Helicopters, R/C Units  
Scale Kits, Gliders  
Engines,  
Small Parts Galore!



YOUR ARE INVITED  
TO BECOME A MEMBER  
OF NRCHA

## NATIONAL RADIO CONTROL HELICOPTER ASSOCIATION

Sponsored by R/C Modeler Magazine, the National R/C Helicopter Association has been established to promote and encourage active participation in sport and competition R/C helicopter flying. It is a vehicle whereby the R/C helicopter builder and flier will have a forum from which to discuss various ideas, helicopter competition rules, and provide a communications media with which to assist the Academy of Model Aeronautics in future programs in conjunction with helicopter contests. The primary purpose of the NRCHA is to encourage the dissemination of information between R/C helicopter pilots as well as to establish and create a self-improvement and achievement program similar to that utilized by the League of Silent Flight. A five step Grade Level Proficiency Program has been established with gold proficiency pins awarded for each grade level you complete successfully.

The Association is a non-profit organization whose administrative and clerical details are handled by the R/C Modeler Magazine staff on a gratis contributory basis.

As a member, you will receive a membership card in the NRCHA and will be assigned a registration number which you can use on your helicopter which will consist of the letter N followed by a number issued on a first come, first serve basis followed by a letter designating the district in which you reside. The annual dues have been established at \$4.00 per year to cover postage, printing, etc. All additional costs will be absorbed by R/C Modeler Magazine.

Your dues will expire 12 months after date you send it in. You will be billed for your renewal 1 month prior to expiration date.

### NRCHA Membership Application

Mail to: \_\_\_\_\_ Date \_\_\_\_\_  
RC MODELER MAGAZINE, P.O. Box 487  
Sierra Madre, California 91024

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_ AMA# \_\_\_\_\_

Please Fill Out The Above And Enclose \$4.00 For  
Annual Dues — Foreign Dues \$5.00

which puts them at 52.19, 52.29, 52.39, 52.49 and 52.59. Notice these are right on the "reserve" frequencies. As I said before, the systems we use are going to have to get better as the RF environment gets more and more polluted.

★ ★

A subject I've thought about discussing for some time is 180 degree retractable landing gear circuits. The following letter triggered me.

Dear Jim,

We met at the Nats in Dayton. I'm the guy who flies on 29.55 Mc. We had a nice discussion about circuits, etc. I'm interested in your circuit for using Goldberg's retract servo and switching it through a 5th channel. I've had a few problems probably brought on by myself using a World Engines servo operating CG retracts. If I set the throw to give a good lock — even using "springy" bends — I get a chatter into the other servos. Not steady, but enough to bother me. If I slacken off on throw, I did get gear collapse at times — too touchy. Using the CG system on motor trim worked fine, but it takes motor trim away which you need at times.

I went to the World Engines retract servo because it was a bargain and I couldn't get an Orbit. To make a long story short, I think your idea is the way to go.

Sincerely,  
Al Lekon  
Greenville, Penn.

I've been using Carl Goldberg's retracts since they first came out and have had excellent results. A large part of it has to do with the installation which I must admit was not easy the first time. I think the main secret is to have no bends and no springiness. You want to keep the pushrods as straight as possible and in the case of the mains, this means keeping the pushrods low and parallel to the bottom of the wing. Once you've accomplished this, you need a good servo that will go precisely through the proper travel each time. This can best be done with limit switches similar to those used in the CG servo mechanics. When the servo gets to the end of the travel, the limit switch opens, turning off the power to the output stage of the servo amp and, therefore, to the motor. The beauty of it is that pulse width adjustments at the transmitter are completely non-critical.



If you've got a CG landing gear servo and a servo amp with external PNP output transistors such as the Kraft or EK, you can build your own. You must isolate the emitters of the PNP's and connect them to the power through the limit switch plate. A sketch of the wiring is shown in Figure 6.

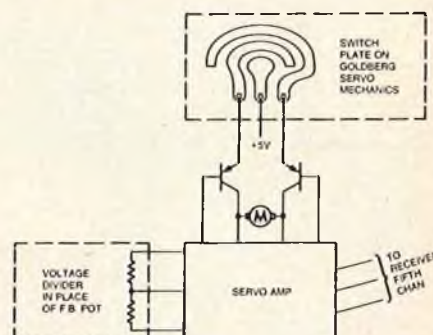


FIGURE 6

You must also replace the feedback pot with a voltage divider so the servo will trigger somewhere close to 1.5 milliseconds. As I said before, it is not critical because the servo will drive one way if the pulse is longer and the other if it is shorter.

I believe there are a number of commercial landing gear servos available. A typical unit manufactured by S & O RC Products is shown in the photo.



★ ★

Anyone out there still looking for unexplained radio problems? I'm beginning to wonder how our systems ever work with all the potential problems we have. Norm Blessum, a fellow Conejo Valley Flyer club member, ran a copy of an article from the Nov. 11, 1971 Electronic Design magazine. The subject is back intermodulation which I must admit I never heard of. Here's the scoop:

"Any time two transmitters are operated close together in both space and frequency, the problem of back intermodulation may arise. Modern communications equipment, with its broad band transmitters and low distortion receivers, is particularly sensitive to this problem. And the use of highly non-linear Class C and Class D amplifiers doesn't help matters. . .

"Briefly, back intermodulation results when the output of one transmitter enters a second transmitter, mixes with the  
to page 178





THE MOST COMPLETE  
STOCK OF AERO AND  
BOATS IN THE FAR EAST.

HANDLING EUROPEAN,  
U.S.A. AND JAPANESE  
RADIO CONTROL, KITS  
AND ACCESSORIES.

ENQUIRIES INVITED

**RADAR CO., LTD.**

3, OBSERVATORY RD., KOWLOON, HONG KONG.

TEL.: 3-680507

## RADIO SPECTRUM

from page 176/16

second transmitter's second harmonic and is retransmitted. For example, transmitter A can be transmitting on 50 MHz and transmitter B on 51 MHz. The signal from B can enter A, mix with A's second harmonic (100 MHz) and be retransmitted at 49 MHz ( $100 - 51 = 49$ )."

Norm provided the following calculations:

$$2 \times 72.16 - 72.08 = 72.24$$

$$2 \times 72.24 - 72.08 = 72.40$$

$$2 \times 72.24 - 72.16 = 72.32$$

$$2 \times 72.16 - 72.24 = 72.08$$

$$2 \times 72.32 - 72.24 = 72.4$$

$$2 \times 72.24 - 72.32 = 72.16$$

$$2 \times 72.24 - 72.40 = 72.08$$

$$2 \times 72.32 - 72.40 = 72.24$$

The article written by D.R. Lohrmann and Lt. James P. Hubert of the U.S. Army Electronics Command went on to describe a technique for eliminating this phenomena with a Class D (switching type) RF amplifier. The technique requires complementary (PNP-NPN) pairs which did not exist for VHF at the time the article was written.

Well, let's here from you experts out there. Ever run into this problem?

★ ★

I've been running tests on the Signetics NE 544 servo amplifier and the results are very good so far. Last month we talked about their linear reference pulse generator so I decided to test it and plot a curve for you in this column. After plotting it on B size graph paper and laying a straight-edge on the points, I decided it would be a waste of time to print the curve because it was perfectly straight. I should point out that I was plotting pulse width in vs. the voltage measured on the feedback pot as a measure of the output. This technique ignores non-linearities in the F.B. pot itself. However, using a Clarostat plastic pot in EK MMIII mechanics (dual rack type), the difference in pulse width to drive the racks to one stop vs. the other was something like six microseconds. My measurement accuracy probably contributed to that. So in summation, if linearity is your hang-up, the NE 544 is for you.

You say neutral stability is more important? I found the NE 544 better than the other amplifiers I have tested with only a six to eight microsecond shift between ambient and 125°F and between ambient and 0°F. With a 10 microsecond deadband, this wouldn't even move the output.

The deadband did change a little bit, particularly at low temperature where the servo actually gets tighter. With the ambient deadband set at 10μsec, the 0°F deadband was 3.1μsec. This could cause some buzzing which is hard on batteries, but is not unacceptable.

to page 180

## METAL SHAPES OR TUBING

LARGEST VARIETY OF SHAPES AND SIZES ANYWHERE

ROUND BRASS  
TUBE (12")

STOCK NO.	SIZE	PRICE EACH
125	1/16	20
126	3/32	25
127	1/8	25
128	5/32	30
129	3/16	35
130	7/32	35
131	1/4	40
132	9/32	45
133	5/16	50
134	11/32	55
135	3/8	60
136	13/32	65
137	7/16	70
138	15/32	75
139	1/2	80
140	17/32	85
141	9/16	90
142	19/32	1.00
143	5/8	1.00
144	21/32	1.10

COPPER TUBE (12")

STOCK NO.	SIZE	PRICE EACH
120	1/8	30

SOFT BRASS FUEL TUBING (12")

STOCK NO.	SIZE	PRICE EACH
121	1/8 x 1/2	35

SQUARE BRASS  
TUBE (12")

STOCK NO.	SIZE	PRICE EACH
149	1/16 x 1/4	35
150	3/32 x 1/4	40
151	1/8 x 1/4	45
152	5/32 x 1/4	50
153	3/16 x 1/4	60
154	7/32 x 1/4	65
155	1/4 x 1/4	70

SOLID BRASS  
ROD (12")

STOCK NO.	SIZE	PRICE EACH
159	.020	108
160	1/32	08
161	3/64	12
162	1/16	20
163	3/32	25
164	1/8	40
165	5/32	50

ROUND PLATED SPRING WIRE (12")

STOCK NO.	SIZE	PRICE EACH
192	.032	06
195	.047	06
197	.035	06
199	.063	09

BRASS  
ANGLE (12")

STOCK NO.	SIZE	PRICE EACH
171	1/8 x 1/8	30
172	5/32 x 5/32	35
173	3/16 x 3/16	45
174	7/32 x 7/32	55
175	1/4 x 1/4	65

BRASS  
CHANNEL (12")

STOCK NO.	SIZE	PRICE EACH
181	1/8	40
182	5/32	45
183	3/16	55
184	7/32	65
185	1/4	75

RECTANGULAR  
BRASS TUBE (12")

STOCK NO.	SIZE	PRICE EACH
262	3/32 x 1/8	1.10
264	1/8 x 1/4	1.05
265	5/32 x 1/8	1.10
268	3/16 x 3/8	1.20

**K&S**

ENGINEERING

6917 West 59th Street, Chicago, Illinois 60638

CATALOG 35c

K5676



# THE NEW MINI-STARTER STARTS THE SMALL ONES FAST!

Quick, sure starts are a must in today's competitive environment.

Whether you are a 1/2-A Pylon Racer who doesn't want to be left in the blocks, or a free flighter who wants to go when the thermals are there, you need this Mini Starter. It is specially designed for 1/2-A glow motors, and features a 12 volt high speed permanent magnet motor with a ball bearing front end. The drive cup is designed to fit the Cox T.D. prop nut or a small spinner, and a groove for a marine O ring is provided. A rubber boot for flywheel starting of Jerabee cars is also provided.

All these deluxe features for only \$15.00. Available at your dealer now.



Also available:

Power Panels..... \$19.95  
12 Volt Gel Cells..... \$26.66  
12 Volt Battery Chargers..... \$8.95  
Everything for your electrical needs. Send SASE for your free catalog.

13377 BEACH AVENUE, VENICE, CALIFORNIA 90291

**ASTRO FLIGHT INC.**  
PIONEERS IN SILENT FLIGHT

## RADIO SPECTRUM

from page 178/16

The biggest problem I've seen so far is the minimum pulse or pulse stretcher circuit. Tantalum capacitors don't perform well with the NE 544 and ceramic caps are not very stable with temperature. So, what is required is a small,

stable capacitor with low inductance, and, oh yeh, it can't cost too much. We'll continue to talk about this amplifier because I think it offers some significant performance advantages over everything else I've seen. I sure can't figure out how my friend Mr. Maloney let this one get away.

★ ★

Well, it's off to Las Vegas tomorrow where I hope I have time to do a little

research to find out what tricks our foreign friends have going for them. I'll try to give you a report in the next issue.  
Adios □

## ENGINE CLINIC

from page 14/10

copy thier ingredients.) With the advent of synthetic oils that will mix with large

**PEERLESS  
KYOSHO**

### NEW LOW PRICES ON KYOSHO "SUPER" KITS

#### No. 1001 F/F TURBO COMMANDER 690 Twin Rubber Powered Kit

\$9.95



A flying model first featuring synchromesh geared mechanism.

Wing Span .. 24"  
Length ..... 16"

#### No. 2101 NEWPORT R/C SAILING YACHT KIT

\$59.95



Length .. 32"  
Beam .... 8.7"  
Mast ..... 47"

A beautiful model sailing yacht kit, complete with Nylon sails and super-detailed scale metal fittings.

#### No. 2104 DASH 8 RACING CYCLE R/C KIT

\$74.95



Body Length .. 15"  
Body Height ... 5"

Simplified construction. ABS pre-colored plastic body. Designed for 2 channel R/C and 15 to 20 gas engines.

(All Kits less R/C and Engine)

#### No. 2105 DASH 9 AMPHIBIOUS BUGGY R/C KIT

\$134.95



Wheel Base 11.4"  
Body Length 19.7"  
Body Width 9.5"

Something new and different. Operates in water, as well as on land. Built-in starter and duct-fan type propeller. .15 to .20 Engines

CATALOG \$1.00 U.S.A. ONLY DEPT. R/C-A

If no dealer available, direct orders accepted with 10% additional charge for handling & shipping.

**PEERLESS CORPORATION**

3919 "M" STREET

PHILADELPHIA, PA. 19124



# SAILPLANES LOVE ELECTRIC POWER

Yes, electric power and soaring are blissfully compatible; both are clean, quiet and lots of fun. Here is a perfect combination:

- The high thrust Astro 05 electric power system.
- The Super Monterey Sailplane, an improved version of the world-famous Monterey that features hands-off stability and an excellent floating glide.
- The rapid charger that charges your electric system in just fifteen minutes from your auto battery.

Now you can fly from that neighborhood field that is too small for a winch or high start. Fly electric! It's the neighborly thing to do. Available at your dealer now.



**ASTRO FLIGHT INC.**  
PIONEERS IN SILENT FLIGHT



13377 BEACH AVENUE, VENICE, CALIFORNIA 90291

Send SASE for FREE Catalog

percentages of nitro methane, you seldom see nitro benzene used any more. But every once in a while, at a Formula 1 pylon race, or U-Control speed contest, you will detect the unforgettable shoe polish smell. I have mentioned many times in the past, the dangers of using nitro benzene in model fuel as it is accumulative in the human system and was suspect as a cancer causing agent. Evidently, this has now been verified.

Although the NIOSH findings were with plain benzene, nitro benzene is even worse. So, any of you old speed men or would-be fuel mixers that still have some of the stuff around — get rid of it. Particularly the few of you who like to take a sniff now and then just to remind you of the old days.

• • •  
That about wraps it up for another month. ☐

## CUNNINGHAM ON R/C

from page 6

into the structure at each joint with white glue, all the way from the front of the aircraft to the tail post and you will construct a fuselage that is probably three or four times stronger than one without this bracing. If you neglect to add this safety feature, you may be surprised to see

GLOBE

**gel/cell®**

12 volt 4.5 amps Model GC 1245-1

**SPECIAL ONLY \$22<sup>98</sup>**

Shipping Free

Add 85¢ for C.O.D.

12 Volt Charger for Gel-Cell only \$7.95

Maintains Tapered Charge

See Your Dealer First OR Order Direct:

Send Check or Money Order to:

**ROVA DISTRIBUTING CO.**

W242 N4251 Hy. F • Pewaukee, WI 53072

GENERAL  ELECTRIC

**Nickel Cadmium  
BATTERIES**

250 ma Power-Up 15 w/tabs	.....	\$3.75
450 ma Power-Up 15 w/tabs	.....	3.95
250 ma Batteries w/tabs	.....	2.80
500 ma Batteries w/tabs	.....	2.95
600 ma Batteries w/tabs	.....	3.75
500 ma 1/2 Sub C w/tabs	.....	3.50
1.2 AH Sub C w/tabs	.....	3.95
500 ma 1/2 Sub C w/tabs	.....	3.95

For Quick Charge Kraft Packs

Add 85¢ for C.O.D., Shipping Free

Dealer Inquiries Invited



**Totally Complete Kit (except glue): Simple fast assembly. Wing, tail & fuselage are fuel proof foam requiring no painting, no covering. Nose section is pre-cut aircraft grade plywood. Step-by-step photo instructions.**



Terry Miller's

## SWEET SIXTEEN

**ORDER DIRECT FROM:  
SHARON ENTERPRISES  
Crestline, Kansas 66728  
Phone: (316) 389-2299**

14 page Photo Instruction Book (160 photos) is sold separately for \$7.50 p.p. (This cost may be deducted from the total price if a kit is ordered at a later date.)

Wing Load,  
11 1/2 oz. per sq. ft.

Flies rudder, elev., & throttle

Chord, 18"

**\$97.50**

16 ft. span  
Flying Wt., 17 lbs.  
For .60 engines or larger

**WITH FOX .78 RC ENGINE \$134.00**

**ALREADY THE PROVEN SUPER TRAINER**

MULTI  
PLEX

**SUPER ALPHA**

**\$99.95**

THE EUROPEAN CLASSIC

SPAN 138"

FOR RUDDER, ELEVATOR  
AND AILERON CONTROLS.



**DELUXE KIT FEATURES:**  
FIBERGLASS FUSELAGE  
MACHINED Balsa & PLYWOOD PARTS  
FORMED PLASTIC CANOPY  
ALL NECESSARY HARDWARE

From Your Dealer or Direct:

TECHNI-MODELS  
P.O. BOX 93282  
GLENDALE, CA. 91206

your pride and joy returned to simple sticks by just a little gust of wind or a freak flip over. I have seen one Powerhouse simply disintegrate by catching a gust of wind at take-off and flipping over on its back. Helmer heeded my advice and added gussets to his Powerhouse when he was building it and, when his battery decided to call it quits for the day, his Powerhouse spiraled in from about four hundred feet and the only damage was a bent landing gear. If you are a super builder, then you can use the new super glues and get your bird done in no time at all. But to do this requires that each and every intersection of sticks must be a perfect fit. This is pretty tough to do, so a better method of construction is to tack glue everything in place with CA's and then when you have the structure complete, go over each joint with white glue applied with a dime store paint brush. Rub this glue into the joints with your finger and when you're done, you will have a strongly constructed fuselage. In addition, it will weigh very little more than the fuselage that was constructed without the extra care.

Next, pay attention to the construction of the wing. I have looked at a number of Old Timer plans and, frankly, the wing construction of most of them frightens me more than a little. When I think that some modelers may try to build their wing like the originals were built, and then put a radio inside and modern engine in the nose and fling this bomb into the air. *Don't* do it. Be prudent. Remember that when most of these aircraft were designed, the engines were less powerful. Horsepower was rated at 1/6th hp, or perhaps 1/5th, and on a really great engine at 1/4th. Take a look at the engines of today. Ratings of 1.5 hp and up are quite common. This is like putting a T-bird engine in a Model-T. Sure you might be able to get it under the hood, but when you step on the gas, watch out!

To be prudent and wise, construct the wings as if you were building a small pattern aircraft or a soaring glider that needed to withstand the pull of a winch without folding the wings. Use spruce spars for the wings. 1/4" square is okay for the 7' types but, for larger wings, use 1/4" x 1/2" spruce spars. Next, use webbing between the spars from the center section to the tip. The webbing need not be glued between the spars, simply let it overlap the front of the top and bottom spars to provide a much stronger glue joint. Again, you can tack everything in place with Hot Stuff or Zap and then paint on the white glue later.

Use plywood and epoxy at the center dihedral brace. A 12" long dihedral brace of 3/16" plywood will do just fine. Use one at the forward spars and another at the rear spars, and don't spare the epoxy. Sheet cover the center section on the top and bottom of the wing with hard 1/16" sheet, add 1/16"

NEAL'S MODELS

SPAN AERO

JEMCO

## CLEARLY A SUPERIOR EPOXY

**STOP WISHING FOR IT! NOW  
THE FINEST EPOXY AVAILABLE  
IS OFFERED CLEAR.**

Kwik Set Epoxy is superior because, unlike other epoxies, Kwik Set does not become brittle with age. Kwik Set is easier to use because it stays put, and has more body.

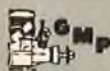
Fuel-proof, water-proof and resistant to most harsh chemicals. Available in flip-top containers - Net. Wt. 10 oz. combined.

PRICE \$5.95

Dealer and Distributor Inquiries Invited



**GAS MODEL PRODUCTS  
9376 Wilcox Drive  
Cincinnati, Ohio 45239**





plywood at the top of the trailing edge to take the compression of the rubber bands, and you will have a wing strong enough to stand up to lots of flying and an occasional bout with the wind or the ground.

Plastic film for covering may not be quite in stride with Old Timer thinking, but neither is silk and dope. If you really want to make your Old Timer look old time, then you should cover it with bamboo paper or silkspan. But if you want it to be pretty, and built to last, use plastic film. After all, your building it to fly, not to hang up and look at. For example, my Powerhouse has several hundred flights on it now and I know that thirty years ago I felt pretty lucky to get 20 flights on a free-flight before it smote the ground or got lost.

Speaking of flying, let's take a look at some of the basics in learning to fly an antique. They are really easy to fly and make an excellent trainer or a transition from soaring flight to powered flight. Let me say right now, however, that it would be almost impossible to go from a soaring aircraft to an Old Timer to a Kaos without some help along the way. The first two steps are fairly easy, but just because you have learned to fly an aircraft with an engine in the nose, does not make you instantly proficient enough to fly a pattern bird. You can learn to fly a pattern or racing aircraft easier because of experience with an Old Timer, but you will still need help.

So much for the sermon, let's go flying. But, before we do, let's do a little pre-flight checking on your plane. Check out the radio first — does it work? Are all of the servo output arms screwed down? Are all of the pushrods secured to the output arms so that they cannot come loose? Are the clevises attached to the control horns and snapped shut? Does the throttle servo move the arm in the correct way? Is up on the transmitter up at the elevator? Is right, right, and left, left? Do you have a good amount of throw on the rudder? Depending upon the aircraft, the rudder throw will need to be quite substantial, several inches in each direction is not bad. When you are test flying, you may get away with just an inch deflection in each direction, but generally this is not enough. Remember that these birds were designed to be stable. They have lots of dihedral and it takes a lot of rudder throw to make the aircraft go where you want it to go, not where it wants to go!

The elevator movement needs to be mostly on the down side. Up elevator really isn't needed much at all. The wing gives you just about all of the up that you need. For test flying, set your elevator movement so that full up is about 1/8", and all of the rest of the movement is down. As an example, once again, when I make a high speed low level pass with my bird, I have to hold full down elevator

to page 185

NEW  
FROM FOX

# Fox Fuel Line

## Your Model's Life Blood Passes Through A Simple Piece Of Fuel Line. Surely You Want The Best!

As engine manufacturers we are acutely aware that a large portion of so called engine problems are in reality **fuel line problems**. Symptoms of fuel line trouble are going lean (air leaks) or speed fluctuations, or inability to get rich enough high speed (restricted flow). Fox Fuel Lines are of the best materials available and physical properties are selected for model use. Fox Fuel Lines are the world's finest.

**Tuff Line - Silicone** - Is by far the strongest on the market - semi transparent: shows if bubbles are in the line: heat resistant. Like all silicone tubing, tends to slip off fittings unless care is taken.

**Neoprene** - Actually a complex compound. Ours is much more elastic than most - clings to fittings - main disadvantage, not transparent.

**Surgical Tubing (Pure Rubber)** Very flexible. Use when sharp bends are necessary. Semi-transparent. Shows if bubbles are in line. Holds on fittings well. Main disadvantage - tends to deteriorate more rapidly than silicone or neoprene.

**Plastic** - Ours is as good as anybody's but we don't think much of any plastic fuel line. Advantage - low price and transparency. Disadvantage - tends to collapse on bends and hardens with age and heat. Tends to leak air at fittings after a while.



ITEM	FUEL LINE	PRICE	ITEM	FUEL LINE	PRICE
86880	Small Neoprene	2' Pkg. .50	86885	Small Clear Plastic	2½' Pkg. .25
86881	Medium Neoprene	2' Pkg. .60	86886	Medium Clear Plastic	2½' Pkg. .30
86882	Large Neoprene	2' Pkg. .70	86887	Large Clear Plastic	2½' Pkg. .40
86883	Small Tuff Line	1' Pkg. .55	86888	Small Surgical Tubing	2' Pkg. .50
86884	Medium Tuff Line	1' Pkg. .70	86889	Med. Surgical Tubing	2' Pkg. .50
86851	Large Tuff Line	1' Pkg. 1.00	86890	Large Surgical Tubing	2' Pkg. .60

## FOX MANUFACTURING

Fox Model Airplane Products

5305 Towson • Fort Smith, Arkansas 72901 • Phone 501-646-1656

## EXPO



'77  
EXPORTATIONS

### WORLD WIDE EXPORT DISTRIBUTORS OF RADIO CONTROL EQUIPMENT, MODELS AND SUPPLIES

Wherever in the world you are located; write, cable or phone **EXPORTATIONS** for all your radio control needs.

Our "MODELLING INDUSTRY BUYERS' GUIDE" shows the latest and best export trade discounts and a wealth of shipping info. The new "EXPO '77HOTLINE" newsletter will bring you up-to-date on the newest products, prices, delivery, sale items, etc. Send for both today!

**EXPORT WHOLESALE ONLY.**

### EXPORTATIONS

125 N. San Gabriel Blvd., San Gabriel, Ca. 91775

Tel: (213) 285-5843 — Cable: EXTRONIC



# RCM PUZZLE

## RCM PUZZLE SPONSORS

Ace R/C  
Aldrich Products, Inc.  
Applied Design Corp.  
Astro Flight, Inc.  
Bluewater Crafts, Ltd.  
Bud Nosen Models  
Coverite  
Craft-Air  
CYT-4 Industries  
D A Enterprises  
D & B Model Aircraft  
D.L. Wright Co.  
Du-Bro Products

Dunham's R & R  
Economy Plus  
Fusite  
Gas Model Products  
Glen Spickler Radiomodels  
Hi Johnson Model Products  
Hobby Barn  
The Hobby Hut  
The Hobby Market  
Hobby World, Inc.  
Indy R/C Sales  
K & B Manufacturing

Mark's Models  
M.E.N.  
Midwest Products Co.  
Mile High Models  
Pacer Industries, Inc.  
Pactra Industries  
Perry Aeromotive  
Phoenix RC  
R/C Modeler Magazine  
Rev Model Products  
Robart Manufacturing  
Rotor Ease  
R & S Hobby Products

See Temp  
Semco  
Slim Line Mufflers  
Solent Sailplanes  
Sonic Tronics  
Southern R/C Products  
Space Age Fuels  
Superior Flying Models  
TT Electronics  
VK Model Aircraft  
Willhold Glues

Here is a Word Hunt for you . . . find the 50 RCM Puzzle Sponsors listed in the puzzle. Read across, down, backward, up, and diagonally, and draw a line through the names you find. We've given you an example by drawing a line through RCM. There are many extra letters just to add to the fun & some overlapping letters that can be used again & again. The sponsors names are listed below as they are spelled in the puzzle.

All correct puzzles are put into a hopper and drawn at random — there is one winner picked for each sponsor. This month there will be 50 winners. You may send photocopies if you wish and only one family member can win each month — Good Luck.

Puzzle must be postmarked on or before February 1, 1977. Void in states where prohibited by law.

Ace RC  
Aldrich Prod  
Applied  
Astro Flight  
Bluewater Crafts  
Bud Nosen Models  
Coverite  
Craft Air  
CYT Ind  
DA Enterprises  
D and B  
DL Wright  
DuBro Products  
Dulaney Ent  
Dunham  
Economy Plus  
Fusite  
Gas Model Products  
Glen Spickler Radiomodels  
Hi Johnson Model Products  
Hobby Barn  
Hobby Hut  
Hobby Market  
Hobby World  
Indy RC  
K and B Mfg  
Marks Model  
MEN  
Midwest Products  
Mile High Models  
Pacer Ind  
Pactra  
Perry  
Phoenix RC  
RCM  
Rev  
Robart Mfg  
Rotor Ease  
R and S Hobby  
See Temp  
Semco  
Slim Line Mufflers  
Solent Sailplanes  
Sonic Tronics  
Southern RC  
Space Age  
Superior  
TT Elec  
VK Model Aircraft  
Willhold Glues

S	B	F	G	T	H	G	I	L	F	O	R	T	S	A	H	M	X	Z	L
O	G	S	L	I	M	L	I	N	E	M	U	F	F	L	E	R	S	J	T
L	A	O	P	A	C	E	R	I	N	D	N	Y	R	N	T	Q	V	A	E
E	S	M	M	K	T	N	E	Y	E	N	A	L	U	D	D	A	K	C	C
N	M	I	D	W	E	S	T	P	R	O	D	U	C	T	S	U	M	H	O
T	O	L	M	I	C	P	K	A	T	H	U	P	L	F	B	W	O	I	N
S	D	E	B	L	R	I	R	O	T	O	R	E	A	S	E	B	D	J	O
A	E	H	S	H	A	C	B	J	I	B	L	E	N	R	B	T	E	O	M
I	L	I	T	O	F	K	A	N	D	B	M	F	G	Y	P	H	L	H	Y
L	P	G	C	L	T	L	A	M	J	Y	G	D	H	C	A	T	A	N	P
P	R	H	U	D	A	E	N	L	P	B	S	U	W	Z	C	H	I	S	L
L	O	M	D	G	I	R	Q	M	D	A	T	K	H	C	T	G	R	O	U
A	D	O	O	L	R	R	O	B	A	R	T	M	F	G	R	I	C	N	S
N	U	D	R	U	U	A	X	P	N	N	I	E	A	F	A	R	R	M	E
E	C	E	P	E	K	D	M	M	D	O	D	C	T	T	X	W	A	O	S
S	T	L	O	S	C	I	F	E	B	J	N	O	H	I	R	L	F	D	I
O	S	S	R	C	M	O	S	T	J	C	E	H	N	P	S	D	T	E	R
U	P	L	B	O	Q	M	V	E	T	W	S	E	D	R	R	U	C	L	P
T	A	B	U	D	N	O	S	E	N	M	O	D	E	L	S	O	F	P	R
H	C	F	D	I	K	D	C	S	R	H	D	N	I	T	Y	C	D	R	E
E	E	A	N	P	V	E	R	V	P	I	W	C	L	M	O	M	S	O	T
R	A	C	T	T	E	L	E	C	N	F	T	B	P	A	J	E	N	D	N
N	G	F	J	C	I	S	X	D	Y	R	R	E	P	H	U	S	O	U	E
R	E	C	H	O	B	B	Y	W	O	R	L	D	A	N	C	R	E	C	A
C	C	S	T	F	A	R	C	R	E	T	A	W	E	U	L	B	N	T	D
B	S	O	N	I	C	T	R	O	N	I	C	S	Y	D	C	R	A	S	Q
R	A	N	D	S	H	O	B	B	Y	M	A	R	K	S	M	O	D	E	L
E	R	O	I	R	E	P	U	S	T	E	K	R	A	M	Y	B	B	O	H

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Clip along dotted line & send to: Send to RCM Puzzle, P.O. Box 487, Sierra Madre, Ca. 91024



from page 183/6

all of the time. If I let up on the elevator the nose points skyward and off it goes. So, use lots of down in your elevator set-up.

Down thrust is a must. If you set up the engine zero-zero, you are really asking for trouble. Again, consider the vast increase in power. The only way to control this power, and make it work for you, is in the use of down thrust.

This works two ways. First, if you are running a powerful new engine, then you have too much power for the high lift wing, and the aircraft will take off and make a loop before you know it. Second, if your engine is marginal, then without down thrust the aircraft will try to climb out on the engine, the wing will give its all in lift, but the engine simply won't be strong enough for the task, and the aircraft will stall. The bottom of the recovery is usually always about six feet below the surface of the earth! Use down thrust to get away from both problems. At least five degrees to start. You may need to add more, or take out some, but start with five degrees for the first test flights. And, use some right thrust — two or three degrees won't hurt a bit.

Next, step back and look at your completed aircraft. Does it *look* right? Is the wing and tail alignment correct? Stand in front of your model and look at the wing and horizontal stabilizer. Are they lined up with each other, or does the stabilizer tilt to the right or to the left? A tilted stabilizer will induce a turn, in this case, an unwanted turn, so get it square.

How about the wing, is it square with the fuselage and with the stabilizer? Correct it if it is not. How about the CG? Where does your bird balance? If your kit, or plan, shows the balance point, does your model balance at this same location? If not, add weight to the nose or to the tail until it balances with the tank empty. However, if you're going to use an 8 ounce tank for both fun flying and soaring, then balance your aircraft with

to page 187

### HOBIE HAWK CRASHES!!

It is with a deep feeling of loss that Coast Catamaran announces it must withdraw the famous Hobie Hawk Radio-Controlled Glider from active production.

Due to the skyrocketing costs of the sophisticated manufacturing techniques required to produce quality radio-controlled gliders, the "Bird" that has withstood numerous crashes in actual use is unable to survive the toughest blow of all — the economic crash.

Even though Coast Catamaran will no longer manufacture Hawks, they will maintain an inventory of parts and accessory items for future orders.

## JANUARY PUZZLE ANSWERS

MODEL  
RUNWAY  
AIRFOIL  
FLOATS  
CLEVIS  
SCALE  
RUDDER

Answer: **MUFFLER**

FILLET  
SPINNER  
SERVO  
ENGINE  
DOWEL  
AIRCRAFT  
DORSAL  
THERMAL

Answer: **FIREWALL**

PITCH  
PULSE  
SPORT  
THRUST  
HOVER  
EPOXY  
RADIO

Answer: **PUSHROD**

STICK  
BALSA  
FLYING  
CHORD  
SPRUCE  
PLYWOOD

Answer: **CANOPY**

### DECEMBER PUZZLE WINNERS

(We accepted puzzles where the answer given was different than ours but was still correct.)  
For example: a boy's name could have been Chris, Carlo, Corky, etc.)

James Allen  
Owen Bailey  
Gerald Besterman  
Robert Breckur  
Dario Brisighella Sr.  
Russ Burnett  
Linda Carlile  
William Christian  
George Codoley  
Bernie Coleman  
Jerry Crego  
Capt. Frank DiBartolomeo  
Don Eble  
Gary Edson  
R.B. Fairley  
Gordon Fisher  
Allan Forsyth

Robert Frost  
David Getsla  
Stanley Gordon  
Chuck Grenci  
Merle Hyde  
Kem Kistler  
Bob Lahde  
Dale Lemmons  
C.J. Long  
Nick Losey  
Ronald Martin  
O.E. Miller  
Leslie Neidig  
Gerald Norway  
Tony Orsini  
Hugh Poling  
Mike Schwartz

Lee Sharafinski  
Stephen Springer  
Buddy Smith  
Thomas Snedeker  
James Steinberg  
Mark Stewart  
Mike Stoneman  
Donald Stricker  
John Szary  
Larry Tillery  
Bob Trockels  
Irwin Weintraub  
Ralph Wellons  
Carl White  
Jack Wright

### COMING NEXT MONTH

TACH-TRON — PART II

THE RCM BASIC BIPE

TED STRADER'S CORKY AMPHIBIAN

**FLASH**  
15 ENGINES

Dealers &amp; Distributors Standard Discounts Apply

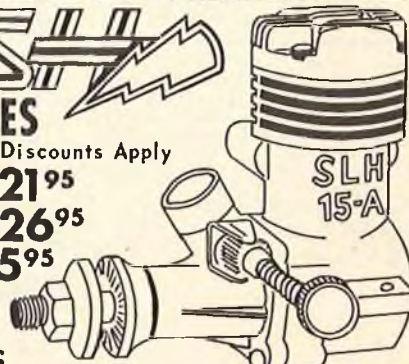
**NEW**

.15 Standard ..... **21<sup>95</sup>**  
.15 R/C ..... **26<sup>95</sup>**  
Muffler ..... **5<sup>95</sup>**

AVAILABLE at your local Dealer,  
or you can order direct.

"FLASH" SLH ENGINES  
**MOD-AD AGENCY, INC.**

146 WEST 22nd STREET,  
NEW YORK, N.Y. 10011







**\$14<sup>50</sup>**

## QUICK CHANGE ARTIST

Reverse servo direction  
without pain  
electronically

- SR-1** Positive pulse w/Deans conn.  
(ACE, Cannon, etc.) **\$14.50**
- SR-2** Positive pulse w/Multicons  
(Kraft, Orbit, etc.) **\$15.95**
- SR-3** Negative pulse w/Deans conn.  
(Pro Line, etc.) **\$14.50**

Direct Orders, add 75 cents  
postage and handling



QUANTIZED CONTROL  
P.O. Box 164  
Amherst, Mass. 01002

## CUNNINGHAM ON R/C

from page 185/6

the tank about half full. This is because most of the time that you will be gliding, the tank will be about half full rather than empty, and eight ounces of fuel can sure make a big difference in the glide ratio of your aircraft. If you are using a one or two ounce tank, then go ahead and balance with an empty tank. If the plans do not show the balance point (and many of the old time plans do not), then start your test flying with a balance point about 1/3rd of the center chord back from the leading edge of the wing. This is a reasonable and normal location. Depending upon your aircraft, you may need to go forward or rearward from this point, but this is a good beginning location.

Now you're just about ready for your initial test flights. Select a prop for your engine with a pitch of 4 or 5 and, at the most, 6. My Max .40 pulls best on a 11/5 prop. Each engine, and each size aircraft will differ a bit on the prop that seems to be best for it, but a general rule of thumb to use is to decrease the pitch 1", and increase the diameter 1" from the standard size prop for that engine — standard size, that is, for normal flying. It may cost you a few props to determine the best one, but experiment a bit.

Well, it can't be put off much longer, it's time to take to the sky. After all, that's what you built this bird for isn't it? Start your engine and let it warm up a bit, so that it will hold an idle. Set the needle so that it is running at four cycle, just breaking to a two cycle, but more on the rich side. Throttle back to idle and check all of the controls.

Now, slowly advance the throttle to about one half setting or less, let the aircraft pick up speed down the runway, or more likely, down the field. Don't lift it off the ground with elevator, let it fly into the air. It will. Stay off of power and, if the nose tends to come up too much, put in a bit of down trim. Let it gently climb out straight away from you. Don't make a turn until you have a hundred feet or more of altitude. Now, start into a right turn and see how your bird reacts to rudder. If it is slow and sluggish you will need to add a bit more rudder movement. Keep flying around in circles, getting adjusted to this type of flying. Grab a bit more sky — say three hundred feet or so — and throttle back to idle. Notice how the aircraft flies at this speed. Is it nose high, or nose down? If you have been careful in your building, and in setting up the wing and tail, it should fly at idle with the fuselage just about level, almost in a gliding attitude. If you have set your throttle to kill the engine at full idle, go ahead and kill the engine and then set up for a gliding type landing. Keep the nose down slightly so that your airspeed will stay up for good rudder control, then bring her home. If you pass

## 'Flyin' Box'



Rugged lightweight fiberglass construction  
Bright molded-in fuel-proof finish  
Available in two models:

**ASSEMBLED \$69.95**  
and now the

**'LECTRIC FLITE CADDY \$139.95**  
The 'Lectric Flite Caddy comes complete with Dual Range Power Panel, H.D. Battery and built-in Charger, Plus Aluminum Legs & Plane Supports (also an option for the Assembled version.)

Specify color: Red, Orange, Blue, White

**SEND FOR FREE CATALOG**

See your dealer or order direct, Prepaid  
Postage on all orders accompanied with  
check or money order.

**CALL NOW! (203) 735-0998**

**AEROTREND**  
PRODUCTS

Dept. BC  
11 Park St.  
Shelton, CT  
06484

# NITROTANE

The Controlled Combustion Fuel®

## WINNER OF

- NO VARNISH
- NO RUST
- BURNS CLEAN
- NO CORROSION

**30**

- OUT PERFORMS THEM ALL
- METAL CANS

## FIRST PLACES AT THE NATS

WRITE:

TM Rcy

### Space Age Fuels

R R 3 — KEWANEE, ILLINOIS 61443

Please send information on your  
SPECIAL BONUS OFFER.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Club Name \_\_\_\_\_

RCM

## NEW! from

**BACA PRODUCTS**

## BELT BUCKLE

Be Proud of Your  
Country and Hobby



Wear this Buckle with Pride

\$ 4.95 each

- Exclusive BACA design
- Engrave your name or your club name on flag
- Available in antique brass or pewter (silver)
- Overall size 2 3/8 X 3 3/4

INQUIRE AT YOUR LOCAL DEALER IF  
UNAVAILABLE ORDER DIRECT, INCLUDE  
\$1.00 FOR HANDLING, IL. RES. 5% TAX.

**BACA PRODUCTS**  
19 HAWTHORNE LN. STREAMWOOD, IL. 60103



# Stanfield's PREMIUM FUEL

YOU'VE TRIED THE REST.....

NOW TRY THE BEST!

F.A.I. FUEL... \$ 7.95

5% NITRO... \$ 8.95

10% NITRO... \$ 9.95

15% NITRO... \$10.95

25% NITRO... \$11.95

NOW  
available in  
DRUMS

Dealer Inquiries Invited

# KING BEE



ENGINE .40 inches

**\$44.95**

☆ PRE-COVERED WINGS

☆ LANDING GEAR

☆ BALSA FUSELAGE

## STANFIELD MANUFACTURING CO.

P.O. BOX 6333 FT. WORTH, TEXAS 76115

# 60 TO GO

# NEW!!

## DIRTY BIRDY 60 SUPER KAOS 40 T60 / T40

ALSO AVAILABLE SUPER KAOS (60)

MACH (60) PHEONIX 6 (60)

.60 MODELS \$130 .40 MODELS \$110

Watch for other great additions to our line in the near future. We built it, you finish it and go like 60!

### 60 TO GO

**stratosales**

In USA  
Box 12  
Noyes, Minnesota  
Zip Code 56740

formerly logictrol canada ltd.  
In Canada  
200 Bannerman Ave.  
Winnipeg, Manitoba R2W 0T4  
Ph. 1 204 589 6321

## AND NOW, AN ELECTRONIC IGNITION FOR GLOW PLUG ENGINES!

ONLY  
**\$24.95**

- TAKES ADVANTAGE OF THE POWER IN A 12 VOLT BATTERY
- MAKES STARTING EASIER
- WORKS WITH ANY PLUG
- HIGH EFFICIENCY CIRCUIT
- GUARANTEED FOR ONE YEAR
- SATISFACTION GUARANTEED (21 DAY TRIAL)

### TRY THIS EXPERIMENT:

Heat a plug the usual way with a 1½ or 2 volt battery. Then blow on the heating element. You will see it cool off. The Electrogrow won't let this happen. It automatically adds power, about 4 to 6 times more, on demand from your glow plug to keep it hot. It doesn't make the plug hotter; it just keeps it from cooling. Other units only tell you when the engine is flooded... The Electrogrow does something about it.

(Battery not included.)

To order, just send \$24.95 in check or money order. For C.O.D., add \$.85. Ohioans please add 4% sales tax.

**THE D. L. WRIGHT CO.**

10190 Dupont St. — Columbia Stn., Ohio 44028



over your head going into the wind, and feel a bit foolish about having to walk some distance to pick up your model, go ahead and feel foolish. It's tough to make a low altitude turn and get back to the field without power, and quite often a modeler will smash up his bird to keep from making a walk. Don't let it bother you, it's a lot easier to take a short walk than to rebuild. And, any knowledgeable flier will know that your choice is correct.

After your first flight you can begin to think about what you need to do to get your bird up to soaring altitude. Naturally, a slow speed take-off won't get you a lot of sky, but you're not ready yet to make this test. On the next flight, again make a nice slow take-off and then, once your aircraft is fifty feet or so in the air, begin to feed in more power. Be ready --- you may find that more power will pull the bird up and over into a loop. Keep a bit of down stick pressure to keep the nose from pointing straight up. On the following flights you may decide to add more down trim to the elevator, or more down thrust to the engine, or more or less weight to the nose. Until you are satisfied that everything is as good as you can make it, keep checking on the trims and the thrust. If your aircraft tends to come down just about as fast as it goes up it is probably nose heavy. Take some stick-on weights and add them to the tail until you have moved the CG back a bit — a little at a time. You may need to add a shim under the leading edge of the wing to get a bit more lift. Check to see if the rubber bands are compressing the cabin, since you may really have a bit of negative incidence in the wing.

It all takes time, study, and a little care, but if you take it easy, and make changes a bit at a time, you will soon find that you have a flying companion that is a lot of fun to be with. □

### FROM THE SHOP

from page 2

Avon Ladies are. Anyway, the assistant finally became aware of what he had done... leaving the poor genius in the I.Q. reducer for such a long period of time. He ran to the other room as fast as he could and unhooked the wires from the guy's head. Of course the poor sap's I.Q. was now down around 10 or so. Concerned, the assistant immediately asked if the ex-genius was alright.

The reply came back in a slow moronic draw! "Ten Four, Good Buddy!"

\*\*\*

I sincerely hope you enjoy this issue of RCM — it contains some of the finest material we have been able to gather together in a single issue since the introduction of RCM in 1963.

Until next month — good flying. □